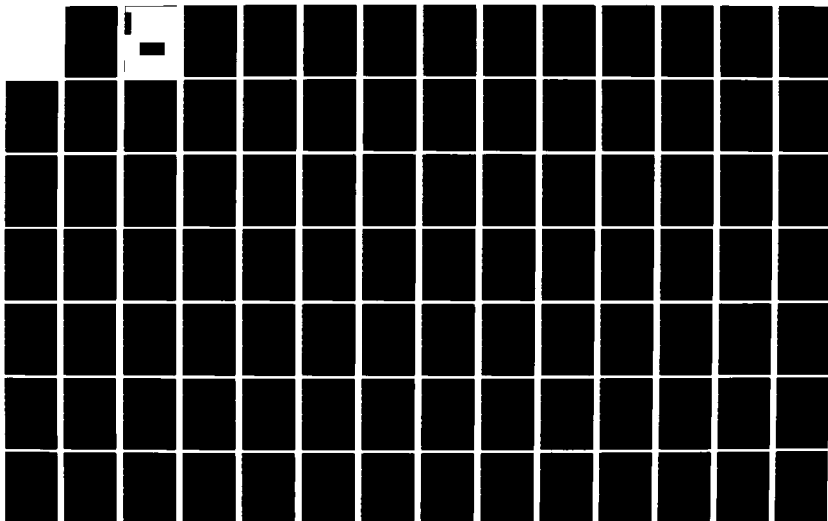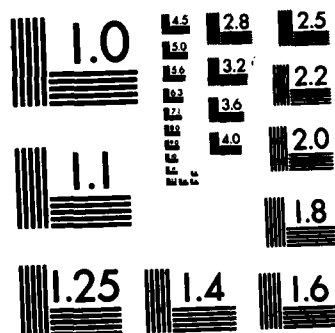AD-A124 836   STATISTICAL TECHNIQUES FOR DETERMINING OFFICER   1/4
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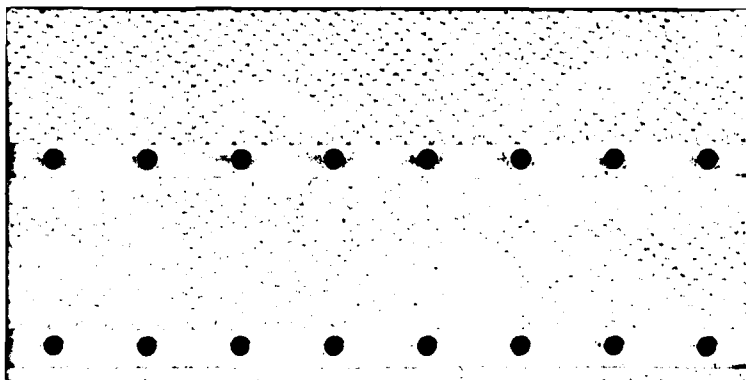UNCLASSIFIED   DEC 82 AFIT/GOR/OS/82D-2   F/G 12/1   NL

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STATISTICAL TECHNIQUES FOR
DETERMINING OFFICER SEPARATION AND
RETIREMENT TRENDS IN THE
UNITED STATES AIR FORCE

THESIS

AFIT/GOR/OS/82D-2

Albert C. Dremstedt
Capt   USAF

Approved for public release; distribution unlimited

AFIT/GOR/OS/82D-2

STATISTICAL TECHNIQUES FOR DETERMINING OFFICER SEPARATION

AND RETIREMENT TRENDS IN THE UNITED STATES AIR FORCE

THESIS

Presented to the Faculty of the School of Engineering

of the Air Force Institute of Technology

Air University

in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

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by

Albert C. Dremstedt

Capt   USAF

Graduate Operations Research

December 1982

Preface

This study was undertaken to provide Air Force personnel managers and analysts with an alternative loss prediction methodology. Although its application within this research was limited to specific loss areas, it is hoped that it can be extended beyond its current scope. Any user who desires additional information concerning specifics of this methodology can contact me at my next assignment:

> HQ TAC/DPY
> Langley AFB, Va. 23665
>
> Autovon 432-4535

I wish to thank Lt Col Ivy Cook and Lt Col Richard Kulp for their thesis suggestions and guidance throughout my AFIT program. Also, I wish to thank Capt Gary Blum and 1st Lt JoAnn Withers for their data support. Both Capt Blum and Lt Withers are assigned to HQ AFMPC/MPCYO, Randolph AFB, Texas. Finally, I wish to express my boundless appreciation and gratitude for the understanding devotion of my wife, Sandra, and the loving assistance of my daughter, Angela, age three.

<div align="right">Albert C. Dremstedt</div>

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ABSTRACT

This thesis develops statistical techniques for determining Air Force officer separations and retirements. The primary source of historical loss information is the Fiscal Year Computerized Officer Projection System report. The analysis techniques used were linear regression and Box and Jenkins' time series.

The regression models developed for both separation and retirement predictions were very accurate. The FY81 separation prediction was in error by only 1.8% and the FY82 separation and retirement predictions were in error by 16.9% and 2.1% respectfully. Moreover, a modified update procedure was in error by only 9.6% for the FY82 separation prediction. This compares to errors in loss predictions of 1.7% to 79.9% for the currently used models. The independent variables used were separation and retirement applications approved and in-system. The R^2 ranged from .75 to .99 for all data bases used in this study.

Although time domain time series models were developed which adequately fit both separation and retirement patterns, both failed to accurately predict either short or long term trends. The inadequacies of these time series models might be remedied by the development of an index of leading indicators or the removal of long term trends by a frequency domain analysis.

STATISTICAL TECHNIQUES FOR DETERMINING OFFICER SEPARATION

AND RETIREMENT TRENDS IN THE UNITED STATES AIR FORCE

I. Introduction

The ability to accurately predict both separation and
retirement trends is a necessity inherent in all aspects of
Air   Force Personnel Management.   This thesis effort
examines the trends associated with Air Force Officer
separations and retirements and then attempts to predict
these trends for both the short and long term needs of
personnel   management.   As will be discussed later,
currently used methodologies have failed to accurately
predict losses so that their estimates have precipitated
the adoption of numerous personnel actions which were
required   to   bring   strength   levels   in   line with
Congressional limits.   Therefore, this research effort
focused its attention on an alternative methodology which
would have significantly improved loss projections.

As noted above, the requirement for accurate loss
projecting is vital to Air Force Personnel Management.
Each branch of the DOD is restricted by public law to be at
or below an authorized strength level at 2400 hours on 30
September of each fiscal year. However, just as the Air
Force is constrained to a maximum strength level, it also

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attempts to come as close as possible to its authorized ceiling in order to meet mission requirements. Therefore, management must continually strive to obtain accurate loss projections with as much lead time as possible so that an adequate time span is available for both the recruiting and training of needed replacements.

Background

Since the end of the Vietnam conflict, large fluctuations in both our authorized strength level and loss rates have caused Air Force management to enact numerous policies, many of which were very unpopular to Air Force personnel. One of the most odious management acts ever adopted was the Reduction in Force (RIF) action which occurred in the mid-1970's. However, this was only the beginning of what was to be a very turbulent period for strength management.

Over the last half decade, two primary models have been developed for projecting Air Force Officer retirements and separations. The primary model in use today is the Air Force Computerized Officer Projecting System (AFCOPS). This model is used for projecting the next two fiscal years of losses (Ref 1). Another model, which is called the Defense Officer Personnel Management System (DOPMS), is a dynamic computerized model which was designed to project losses throughout the Five Year Defense Plan (FYDP) (Ref

1). A complete discussion of each of these models follows.

The AFCOPS model, as mentioned above, is a computerized model for projecting Air Force Officer losses. Using either one or two year loss statistics, this model divides losses into categories where the personal attributes of everyone in a given category or cell are identical. Such a category may be comprised of all pilots that are married, have one dependent, have completed a masters degree program, are ROTC graduates, and have seven years of total active commissioned service. Once the historical loss data has been catagorized accordingly, loss rates are calculated by dividing the number lost in each cell by the beginning active duty population in that cell. If, for example, at the beginning of FY79 there were 1000 individuals in a particular cell and 250 of those individuals separated from the service during the next fiscal year, then a loss rate of 25% would be used to project losses for the next fiscal year. Thus, if 500 individuals were in this same loss category at the beginning of FY80, then 125 losses would be projected to occur.

The DOPMS model is similar to the AFCOPS model, except that it ages the force each year by adding estimated gains and then subtracting the estimated losses from the beginning population. The model then uses this number as the beginning population for the next fiscal year.

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However, the DOPMS model does not calculate the loss rates which it uses for predicting, but instead uses the loss rates which are calculated by the AFCOPS model.

Actions Available to Meet End Strength. In an effort to meet end strength, recruiting goals and objectives must be set years in advance. To produce an officer from the Air Force Academy, a minimum lead time of four years is required; to produce an officer from ROTC, a minimum lead time of two years is required; and, to produce an officer out of OTS, a lead time of about six months is necessary. Therefore, when large fluctuations in loss rates occur, it becomes increasingly difficult to reduce or increase our strength levels by varying our accessions. For these reasons, if management is to offset changing retention patterns by adjusting recruitment goals, significant lead time is required. However, other personnel actions are possible and have occurred. The following is a list of personnel actions which have either been adopted or discussed for possible implementation during the past three fiscal years (Ref 1):

* designates actions which have been implemented within the last three fiscal years

1. Separate flight and tech training eliminees*

2. Increase Palace Chase quotas*

3. Relax miscellaneous reason separations*

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4. Ease waiver restrictions for DOS six month
    notice*

5. Voluntary retirement rollback*

6. Ease DOS withdrawal restrictions

7. Suspend retirement continuations

8. Eliminate retirement date withdrawals*

9. Permit voluntary separation of one-time
    failures to temporary captain

10. Limit continuation of non-critical two-time
    failures to temporary major*

11. Delay accessing Airmen Education and
    Commissioning Program graduates until the
    next fiscal year*

12. Delay ROTC engineer accessions until the
    next fiscal year*

13. Delay reserve recall pilots until the next
    fiscal year*

14. Suspend all OTS technical and non-technical
    accessions*

15. Implement an early release program

16. Ask Congress for an end strength
    supplemental*

17. Separate one-time failures to temporary
    major*

18. Involuntary DOS rollback

19. RIF

20. Cancel the ASCRO program
    (Reserve Officers with more than twenty
    years of active commissioned service)

As would be expected, not all of the above mentioned

policies have been implemented, partly due to the adverse

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publicity which they would cause and partly due to Congressional approval which would be required for any action such as a RIF or early release program. However, that is not to say that many of the policies listed above could not or would not be implemented should our loss rates continue to fluctuate to the degree which they have over the last few years.

In addition to the adverse publicity associated with many of these actions, whenever ROTC or OTS accessions are utilized as strength balancing tools (accession dates are delayed until the next fiscal year), a bow-wave of ROTC or OTS accessions develop. Over the past several years, this number has grown drastically. Currently, there are well in excess of 1000 ROTC graduates who normally would have been accessed in the current fiscal year (Ref 1), but, because of strength restrictions and changing loss trends, are being delayed until next fiscal year. This in turn results in those individuals who will be graduating next year having to wait until the following fiscal year before they can enter active service. One can easily imagine the personal financial hardships which often beset those individuals who must wait to enter active duty, especially considering the difficulty associated with finding interim employment in today's economic environment.

Therefore, it was in the area of loss trend analysis which I focused my attention. I hoped that by using

regression analysis to project short term (current fiscal year) losses and time series analysis to project both short and long term trends, that the personnel actions which have been explored and/or implemented during the past decade could either be eliminated or reduced to a minimum.

Thesis Overview

This thesis is divided into five primary sections. The first section deals with a regression analysis of voluntary separations, while section two analyzes similar line officer voluntary separation rates by means of a time series analysis. Section three models Air Force officer retirement trends by means of regression analysis, with section four analyzing the line officer retirement rates as a simple time series. Also, conclusions and recommendations dealing with the findings of each section are noted at the end of that section. Finally, the last section summarizes all of the conclusions and recommendations which were considered significant.

II. Regression Analysis of Separation Application Patterns

Methodology

A simple stepwise multiple linear regression program, or more specifically the Statistical Package for the Social Sciences (SPSS) regression package (Ref 8), was used to model separation application trends for Air Force officer personnel. Date of Separations (DOS) with a Separation Designator (SPD) and DOSs without an SPD were used as the independent variables. Accomplished losses by month were used as the dependent variable. Normally, DOSs with an SPD are defined as officer career separations (officers who separate more than one year after the end of their initial obligations), while DOSs without an SPD are officers which are eligible to separation immediately following or within one year after completion of initial obligation. Initial obligation ranges from four years for non-rated officers to seven years for rated officers (pilots and navigators).

The primary source of loss information used in each data base is the Fiscal Year Computerized Officer Projection System (FYCOPS) Report. This report, which is produced at the end of each month at the Air Force Manpower and Personnel Center (AFMPC), was originally designed to facilitate the tracking and control of normal separations and retirements as well as management-controlled loss

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programs such as 7-Day Option, Early Release, and Palace Chase. Examples of pages from this report used for this thesis are contained in Appendix A.

Data Base Configuration

The data base for projecting current FY losses is comprised of twelve subfiles, each containing historical data pertaining to separation application patterns for a given number of months prior to the month in which the losses actually occurred. A listing of these files, labeled SEP1 through SEP12, can be found in Appendix B. As can be seen in the appendix, each file is comprised of three columns. The number in the first column is the dependent variable accomplished losses, with the numbers in the two following columns corresponding to the independent variables DOS without an SPD and DOS with an SPD.

In order to more fully explain the composition of these files, an example is presented. Individuals are required by Air Force policy to submit an application for separation at least 180 days prior to their desired separation date, barring unforeseen hardship, medical or other special circumstance. This advance notification requirement is therefore the foundation to the data bases' design. An examination of SEP3's first entry, "274 146 234" signifies that in July 1979, 274 separations occurred, and that three months prior to July 1979, there were 234

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approved   career   separations   in-system   and   146   other
officers   who   were   scheduled   to   complete   their   initial
obligations   in   the month of July, but had not yet notified
AFMPC as to their separation intentions.

As   noted,   an   Air   Force   officer   is   required to submit
an   application   for   DOS   at   least   180   days   prior   to a
requested   separation   date.   However, prior to March 1979,
only   90   days notification was required.   Therefore, due to
the   impact   which   this   policy   change   had on application
trends,   each   data base's observations have been restricted
to   only   those separation actions which have occurred since
May 1979.

Regression Results

All   preliminary   analyses   were accomplished on AFIT's
Cyber   computer   using   the SPSS Regression package. A copy
of   each   data   base's   SPSS   listing is in Appendix C.   The
initial   results   were   impressive.   Using   data as of May
1982,   the R^2 statistic ranged from .99 for one month out
(SEP1)   to   .75   for   twelve   months   out   (SEP12).   The R^2
statistic   measures   the   proportionate   reduction   of tota¹
variation   in the dependent variable associated with the use
of   the   set   of independent variables. An R^2 of one exists
when   all   observations fall directly on the fitted response
surface.   Also,   because an R^2 value of one will always be
obtained   whenever   the   number   of   independent   variables

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equals the number of observations, an adjusted R^2 is sometimes used. In essence, the adjusted R^2 recognizes the number of independent variables in the model and adjusts the R^2 statistic accordingly. In fact, the adjusted R^2 may actually become smaller when another independent variable is introduced into the model because the decrease in the Error Sum of Squares (SSE) may be more than offset by the loss of a degree of freedom in the denominator. A summary listing of both R^2s and other major statistics are in Tables I and II.

In examining the change in the adjusted R^2 across the data bases, a significant decrease after SEP6 was observed; however, this was not unexpected. As mentioned earlier, an individual is required to submit a DOS application 180 days prior to a requested separation date. Therefore, more variability in the data in files SEP7 through SEP12 would be expected.

In further analysis of the regression results, the F statistic was also found to show similar results. This statistic, which indicates whether the sample of observations being analyzed has been drawn from a population in which the multiple correlation is equal to zero, ranged from 1848 for SEP1 to 41.4 for SEP12. Comparing these values to an F distribution table indicated that each of the twelve data bases F statistic was statistically significant at the 95% confidence level.

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TABLE I

Regression Summary Statistics (Part A)
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
SEP1	1847.991	.99088	.99035	2.5129
SEP2	1081.490	.98406	.98309	2.3699
SEP3	649.053	.97594	.97444	2.2131
SEP4	375.835	.96309	.95784	2.1274
SEP5	264.352	.94630	.94272	2.8244
SEP6	247.965	.94296	.93916	2.0599
SEP7	109.962	.88350	.87546	1.6546
SEP8	80.462	.85179	.84121	1.9467
SEP9	133.680	.89311	.88642	1.7726
SEP10	107.084	.87356	.86540	1.5905
SEP11	72.849	.82925	.81787	1.7120
SEP12	41.393	.74726	.72921	1.6680

TABLE II

Regression Summary Statistics (Part B)			
		VARIABLE F STATISTICS	
FILE	NO. OF OBS.	DOS WITH SPD	DOS W/O SPD
SEP1	37	3554.36	57.33
SEP2	36	1844.89	49.59
SEP3	35	971.86	46.95
SEP4	34	673.45	32.67
SEP5	33	515.78	15.98
SEP6	33	486.89	20.04
SEP7	32	215.13	17.60
SEP8	31	159.29	24.07
SEP9	35	253.37	32.32
SEP10	34	210.57	29.19
SEP11	33	145.37	24.59
SEP12	31	82.43	25.01

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Similarly, the F statistic associated with each coefficient was also statistically significant at alpha equal to .05.

Finally, each residual plot was examined for normality, constant variance and positive autocorrelation. Again, just as with the other statistical areas, no significant problems were encountered; that is, the Durbin-Watson statistic was above the upper bound for positive autocorrelation in all twelve residual plots, and a subjective assessment of the constant variance and normality assumptions failed to detect any significant problems.

Model Testing

As with any model, the testing and evaluation phase is as important as any other phase of model development. In order to accomplish this phase, data which was recorded subsequent to 30 September 1980 was deleted from the files. Following this, all twelve regressions were reaccomplished with the final output being a month-by-month projection of expected officer separations for Fiscal Year 1981. Figure 1 compares the FY81 predicted losses with the actual FY81 loss data. After the FY81 projections were completed, the data bases were updated with information through 30 September 1981 and the twelve regressions were performed again so as to obtain an FY82 loss prediction. Figure 2 compares the prediction for FY82 to the actual observed

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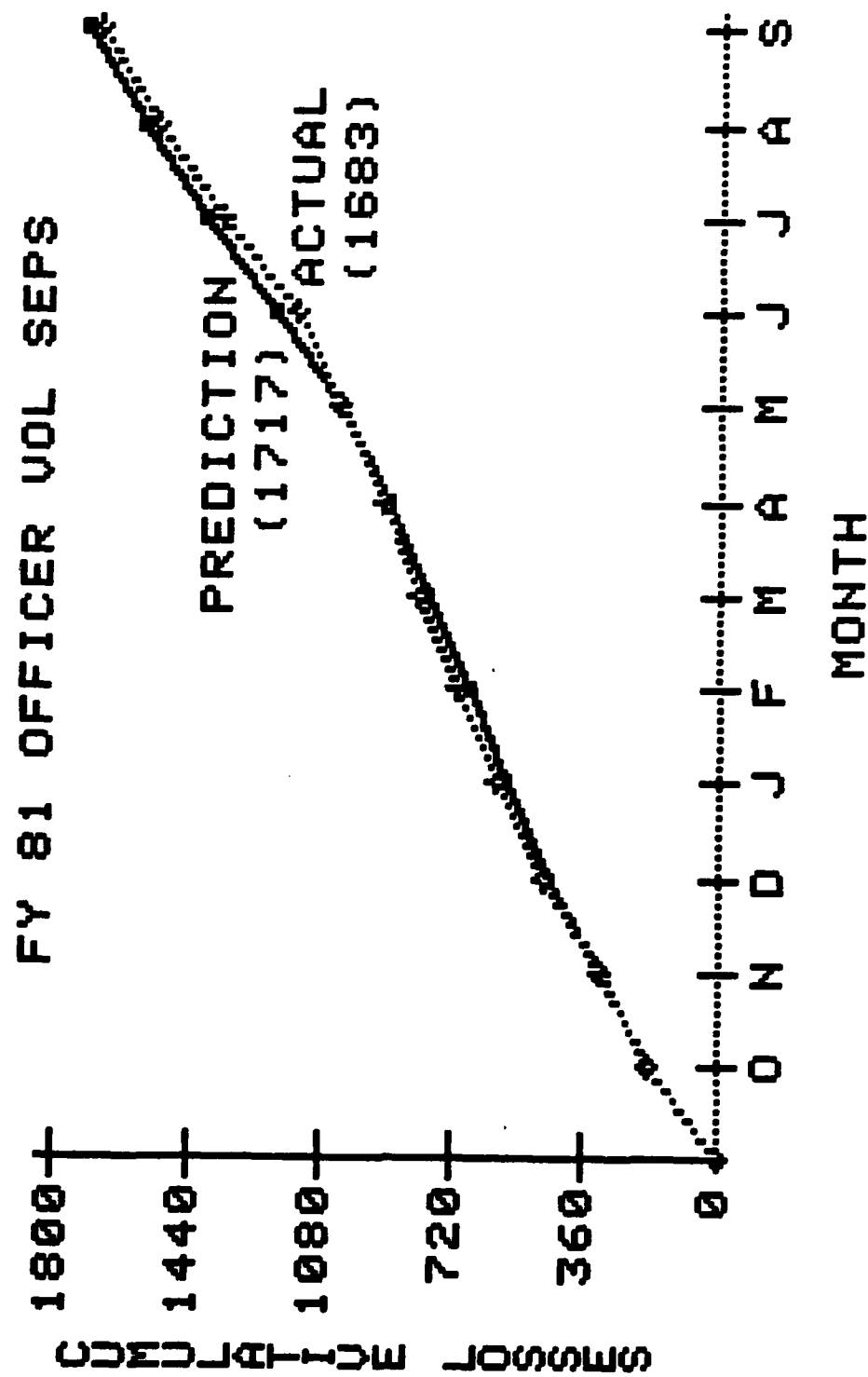
FIGURE 1. FY81 Officer Actual Vol Seps vs Prediction

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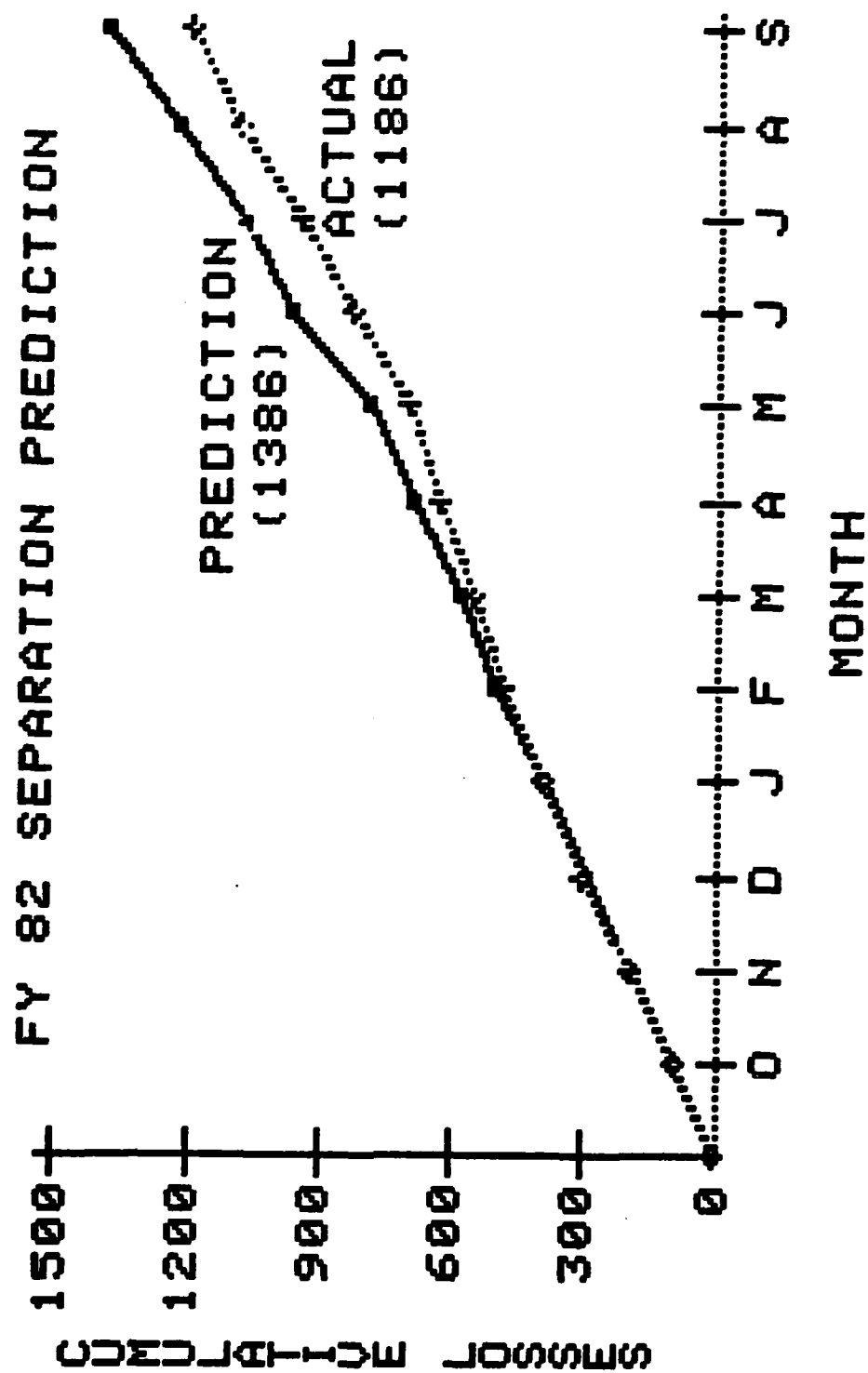
FIGURE 2. FY82 Officer Actual Vol Seps vs Prediction

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losses. Although the FY81 estimate was within 2% of the
actual 1683 separations, the FY82 prediction was in error
by approximately 16.9%. Therefore, additional analysis was
made in an attempt to offset the trend which accounted for
this significant overestimate.

Initially, the additional analysis entailed an
examination of the FY82 loss prediction. This analysis,
revealed that the overprediction was not due to any
particular month's prediction, but that it was due to a
consistent overprediction for each month. The following
table details these errors:

Table III

FY82 Prediction Erors			
Month	Pred.	Actual	Error
Oct	98	94	+ 4.2%
Nov	97	99	- 2.1%
Dec	102	101	+ 1.0%
Jan	100	91	+ 9.9%
Feb	103	84	+22.6%
Mar	83	73	+13.7%
Apr	106	76	+39.5%
May	105	74	+41.9%
Jun	176	131	+34.4%
Jul	105	117	-10.3%
Aug	154	141	+ 9.2%
Sep	156	105	+48.6%

Since no single month's error appeared to be the cause of
the overprediction, it was believed that a change in the
application submission pattern may have occurred.
Therefore, the next phase of model development was to
attempt to identify the cause, and then develop a

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modification to the originally proposed model, one which would capture the changing application trends.

Model Investigation

Initially, the data bases contained data which had been compiled since the DOS application lead time was changed from 90 days to 180 days, with the number of observations in each data base varying from 37 in SEP1 to 31 in SEP12. Even though all the statistics were within a 95% confidence test, it was felt that data base size (number of observations recorded) may be responsible in part for the model's inability to capture changing application patterns. If too many observations are recorded, then the regression analysis technique will be slow in detecting a change in application trends. On the other hand, if too few observations are contained in the data bases, an outlier may have a significant undesirable impact on the calculated regression equations. In other words, because of the inherent nature of linear regression models, equations derived from large data bases will be slow in capturing changing application patterns. In addition, even though this methodology assumes that consecutive fiscal year patterns are similar, one can not assume that the application patterns of years which are several years apart are similar in nature,. As economic and management policies change, so can application

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submittal patterns. Therefore, this phase of model development was to determine if a limited number of observations would improve the model's prediction ability.

Methodology. The determination of an optimal number of observations was divided into two subprojects. The first was to determine at what number of observations the adjusted R^2 and the square root of the MSE (SPSS's standard deviation) would be optimized. The second subproject was to ascertain if the number of observations in the data bases would affect the prediction error which is associated with each data base.

Adjusted R^2 and Standard Deviation. Using data as of May 1982, each data base had consecutive regression runs compiled with each run using one less data point. The observation removed was in all instances the oldest observation in the data base; that is, initially SEP1 contained all thirty-seven data points, the oldest data point was then removed and the regression statistics recomputed. This was repeated until only the most recent twelve observations were remaining in SEP1. This same methodology was then repeated for the remaining eleven data bases. A summary of each data base's regression statistics as well as a graphical display of each data base's adjusted R^2 and standard deviation can be found in Appendix D.

As mentioned before, this phase of model investigation was designed to determine an optimal number of observations

which should be recorded in each data base. To accomplish this, an independent analysis of each data base's adjusted R^2 and standard deviation was made. The following table summarizes the results of these analyses:

Table IV

Optimal Data Base Sizes	
Data Base	Optimal # of observations*
SEP1	23 to 37
SEP2	18 to 22
SEP3	18 to 20
SEP4	23 to 24
SEP5	23 to 24
SEP6	23 to 24
SEP7	22 to 23
SEP8	22 to 23
SEP9	22 to 23
SEP10	22 to 24
SEP11	24
SEP12	24

* - Determined by observing where the adjusted R^2 was maximized and where the standard deviation was minimized.

Since an analysis of each individual data base indicated a range where this best number would exist, and since maintaining a different number of observations in each data base would complicate the operational use of the proposed methodology, an average of the adjusted R^2s and an average of the standard deviations were computed. It was hoped that these average statistics would provide insight into an overall best number of observations which could be used. Graphical displays of these averages are shown in Figures 3 and 4.
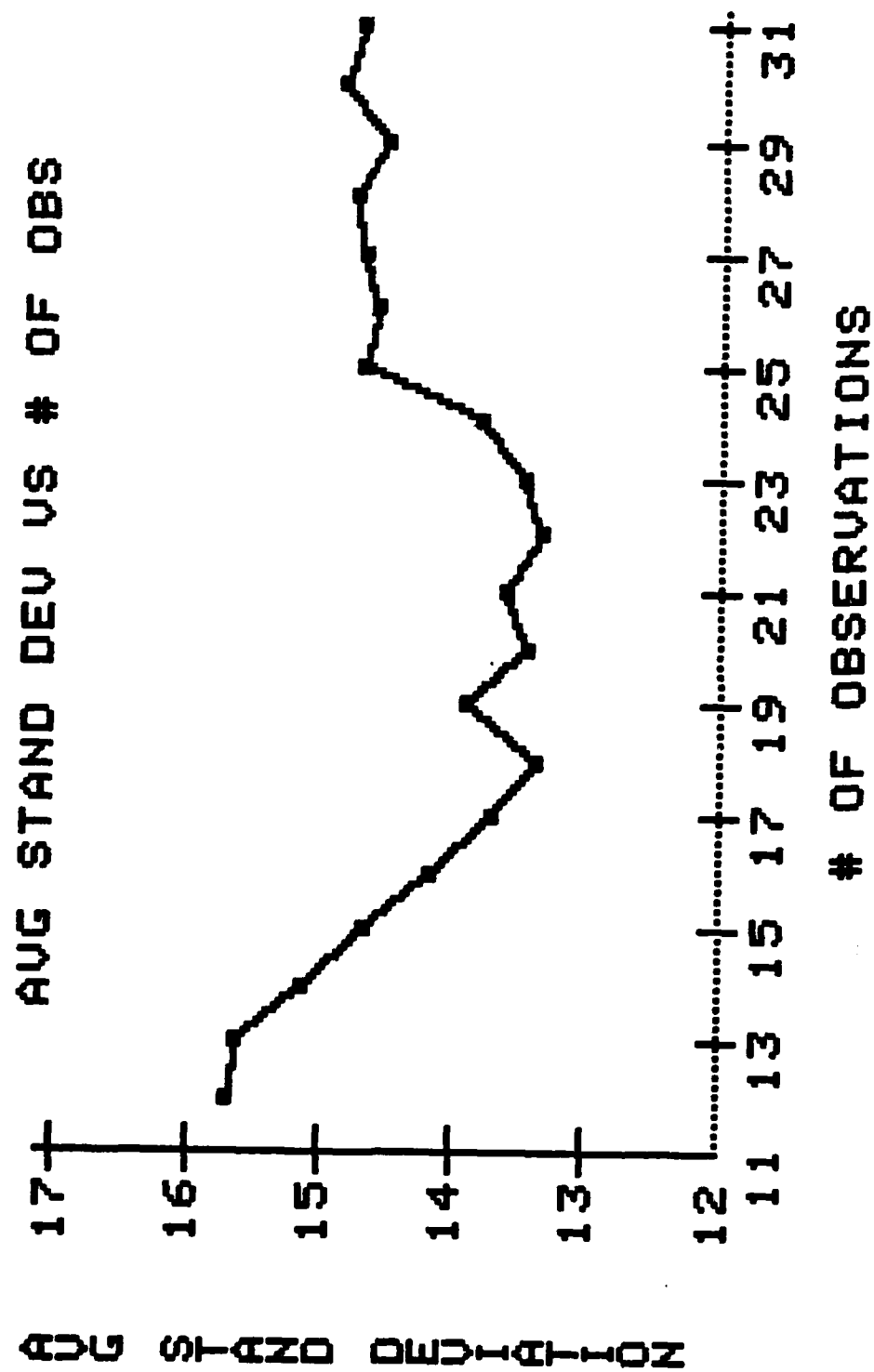
FIGURE 3. Avg Standard Deviation vs # of Observations
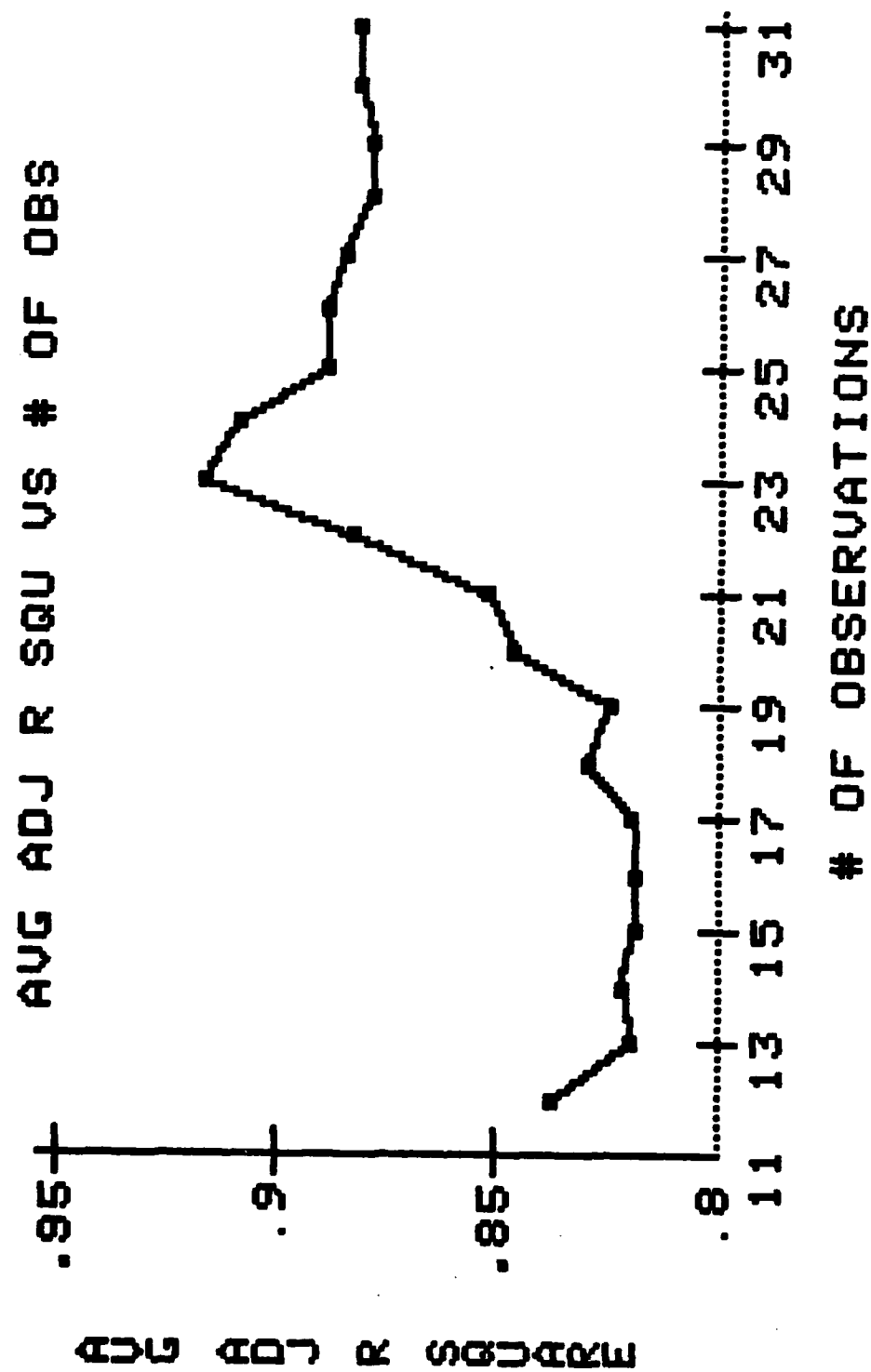
FIGURE 4. Avg Adjusted R^2 vs # of Observations

The analysis of these graphs indicated that the optimal number of observations which should be maintained in the data bases would be twenty-three. However, since there is not a statistically significant difference between twenty-three or twenty-four, and since twenty-four (two years of) historical observations might be more palatable to managers, two years of observations is recommended.

Prediction Error Minimization. Although determining an optimal number of observations by maximizing R and minimizing standard deviation is desirable, the primary purpose of this phase was to try to decrease the prediction error. Therefore, changes in the prediction error for SEP1 through SEP9 were calculated for different data base sizes. Data bases SEP10 through SEP12 were not analyzed because of small data base sizes. That is, in order to project losses for a given month from a data base such as SEP12, all entries subsequent to twelve months prior to that month would have had to have been removed. Since SEP12 had only thirty-one observations at the time of this analysis, removing twelve would have left only nineteen for projecting the most current observation.

In order to accomplish the prediction error minimization phase, the data bases were altered so that they would appear just as they would have if actual predictions had been made. In other words, to predict a month's losses with SEP5, all data recorded subsequent to

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five months prior would be removed from that data base. Then, using this modified data base, different sizes of data bases would be used to predict the observed month's losses. In most cases, the number of observations used ranged from twenty to twenty-five since this was the area which the first phase of model investigation had identified as optimal. However, just as with the small number problem associated with SEP10 through SEP12, data base size also reduced the number of predictions which could be made with the remaining nine data bases. Also, even though it would have been better if a large number of predictions within each data base could have been estimated, a maximum of ten predictions for each data base was all that was realistically possible. A comprehensive list of the prediction errors for SEP1 through SEP9 is in Appendix E.

When this analysis was made, two findings of significance surfaced. First, the standard deviation of the prediction errors failed to display a significant increasing or decreasing pattern for the different data base sizes. Second, and perhaps the most important, was that as the number of observations in the data bases decreased, so did the mean of the errors. In other words, the overprediction which existed when the number of observations was maximized tended to decrease as the number of observations in the data base decreased. However, based upon the hypothesis of changing application patterns, this

was not unexpected. The fewer the observations, the easier it is for regression analysis to capture changing trends, but on the other hand, it must also be remembered that the smaller data base sizes would result in larger prediction intervals as calculated by regression packages because the mean square error tended to increase as the data base size decreased. In essence, if small data base sizes were to be adopted, then the possibility of larger errors would exist, while if large data base sizes were adopted, then the mean of the loss predictions may be further from the actual loss numbers, but the expected error interval would be smaller.

Although this exercise failed to provide additional information which would be helpful in identifying an optimal number of observations for predicting, it did provide further insight into the hypothesized cause for the overpredictions, that being changing application submission patterns.

Conclusions

The hypothesis that current fiscal year separations can be predicted by regression analysis appears to be valid; however, problems still exist in the methodology. One such problem is the inability to capture changing application patterns. Even with twenty-four observations maintained in the data base, the proposed model appears to be slow in apprehending varying application patterns. In

fact, had twenty-four observations been used in each data base when projecting FY82 losses, an additional cumulative error of +11 would have occurred in the prediction. A comparison of the original predictions for FY82 and the predictions using the most recent twenty-four observations for FY82 can be found below in Table V:

Table V

Comparison of FY82's Predictions Maximum Number of Observations vs The Most Recent Twenty-Four Observations												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Max # of Obs	98	97	102	103	103	83	106	105	176	105	154	156	1386
24 Obs	101	100	103	101	105	85	106	105	176	104	155	156	1397
Actual	94	99	101	91	84	73	76	74	131	117	141	105	1186

Recommendations

The recommendation for this chapter is simple, additional research must be accomplished regarding modifications which would improve the model's ability to capture changing patterns. This research could probably take on three paths. One would be to analyze the pattern of prediction errors by means of a time series analysis model. A second path would be to weight the observations according to a subjective assessment of their importance. Finally, the third path would be to further analyze the regression model methodology itself. Since some

preliminary work has been completed in this area, it is explained in more detail.

As noted before, a modification to the methodology must be developed which would aid in identifying changing application patterns. An examination of the proposed methodology indicates one possible flaw. When predicting the twelfth month of a twelve month prediction, data which is at best twelve months old is used. In essence, there is at least a twenty-four month difference between the data and the prediction. Although this example is the extreme of the proposed methodology, it does indicate a reason for the model's inability to capture changing patterns. Therefore, if this time span could be decreased, the result may be a decrease in the prediction error.

Within this area, one possibility which was explored was the updating of data bases with projections from other data bases. In other words, after the projection for one month out had been made, that prediction was used as the dependent variable for updating SEP2. Following this, SEP2's two month out prediction, along with SEP1's prediction was then used to update the data base SEP3, with the result being a new projection for three months out. This process was continued until all twelve data bases had been updated and projections for all twelve months recomputed.

This modified data base update procedure was tested

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with FY82 data since the previous methodology's prediction error for this fiscal year was significantly high. The results of this exercise are contained below in Table VI:

Table VI

Modified Model's Prediction Errors (FY82)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Modified Proposal	101	100	103	98	102	86	99	98	161	96	123	133
Original Proposal	98	97	102	100	103	83	106	105	176	105	154	156
Actual	94	99	101	91	84	73	76	74	131	117	141	105

In the aggregate, the prediction error was decreased from approximately 16.9% to 9.6%, or in other words, a 43.2% improvement was realized. However, it must be remembered that this is but one sample dealing with this modification. Time precluded additional analysis from being completed.

In summary, although the overall results are impressive, more analysis should be completed before full scale operational use is begun. Not only is it apparent that this methodology has merit, it is also apparent that with additional research, improved accuracy of predictions can in all probability be accomplished.

III. Time Series Analysis of Separation Data

Methodology and Data Base

An autoregressive integrated moving average process
(ARIMA) model was fitted to the separation data by means of
Box and Jenkins' techniques (Ref 2). The data used in this
analysis was a ratio of losses to population expressed in
percents.   The population itself was made up of rated
officers between their sixth and nineteenth year of service
and of non-rated officers between their fourth and
nineteenth year of service.   The loss data used in this
analysis was the same as that used in the current fiscal
year regression analysis except for the removal of nonline
loss data.   This removal was necessary because of
incomplete historical listings pertaining to nonline
population sizes.

Also, because of strength reduction programs which
occurred in the mid-1970's, the data base had to be
restricted to losses which had occurred subsequent to
December 1976.   This data base restriction was necessary
since many losses which normally would have occurred in
1975 and 1976 were accelerated to 1973, 1974, and 1975
because of post-Vietnam Reduction in Force (RIF) programs.

Model Identification

The ratio data was analyzed as a simple time series using a program written for the CYBER computer. This program was designed to utilize catalogued subroutines from the IMSL Library. A copy of this program, named TS, can be found in Appendix P. Initially, the simple and partial autocorrelations were examined for significant lags and/or damped exponential or sinusoidal patterns. The computer generated plots of both autocorrelations can be found in Figures 5 and 6. As can be seen, the simple autocorrelation plot has a distinctive sinusoidal pattern, while the partial autocorrelation plot appears to have only one significant partial autocorrelation at lag 1. This in itself, would tend to imply an autoregressive process of order 1. However, additional tools for model identification were examined before a specific model was selected for residual analysis.

Following the autocorrelation anaylsis, the computer generated periodogram table was examined for indications of significant frequencies inherent in the data. This analysis indicated that a seasonal wave of length twelve may be present. However, this was not unexpected since losses are known to increase during the summer months and then decrease during the winter months. Therefore, in order to test the significance of these and other periodogram values, an average periodogram value was

30
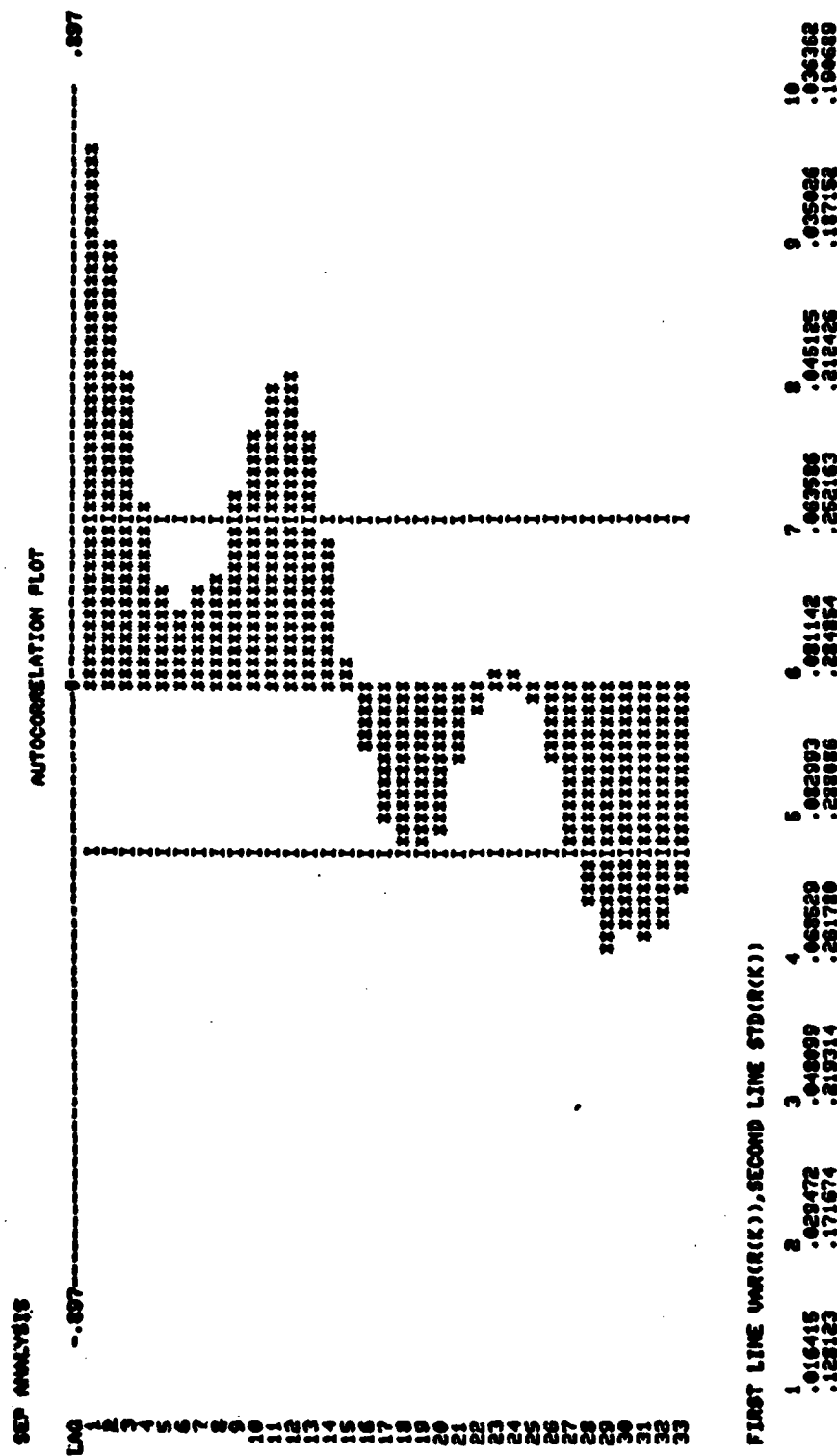
FIGURE 5. Autocorrelation Plot for Separation Data
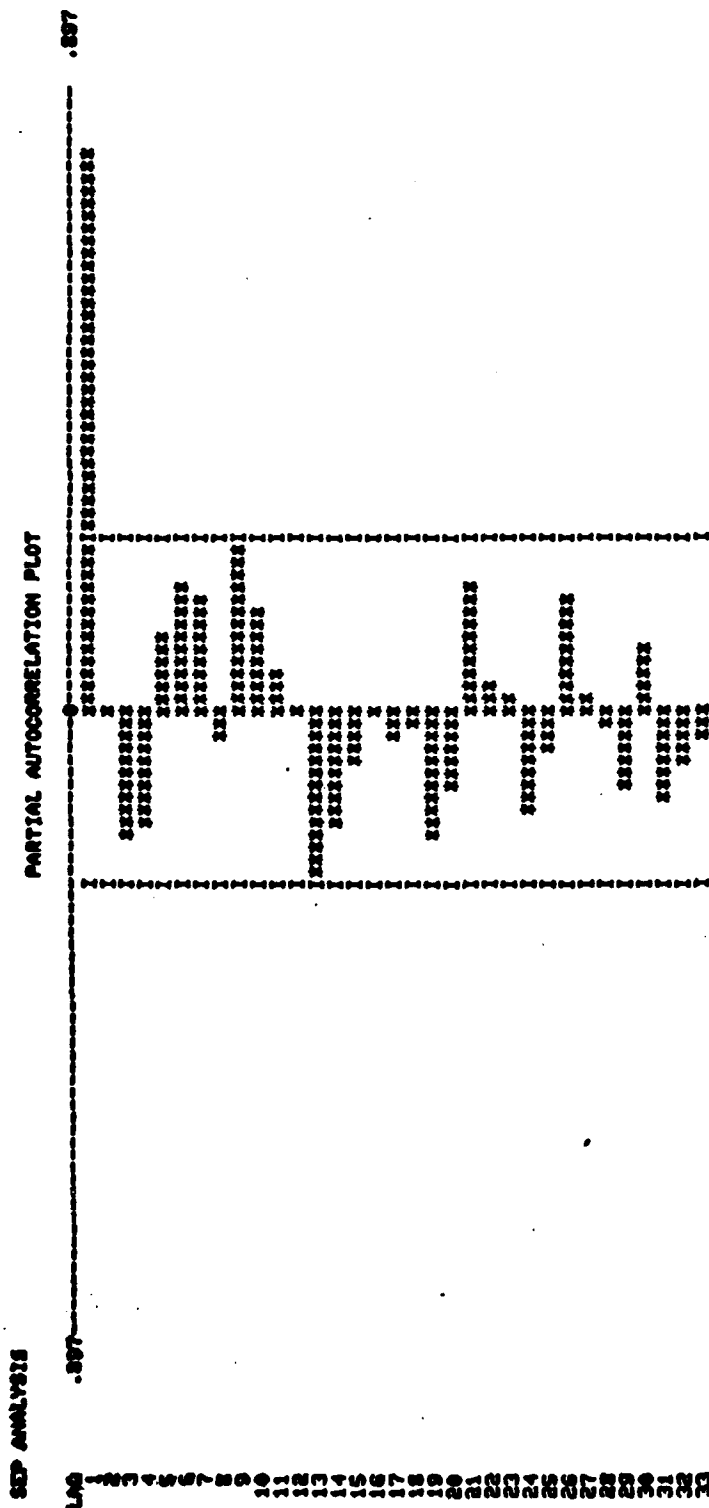
FIGURE 6. Partial Autocorrelation Plot for Separation Data

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calculated and then multiplied by a value obtained from a distribution table which can be found in Fuller, 1972 (Ref 3:350-353). Essentially, any periodogram value which is calculated to be above this product can be considered statistically significant (throughout the remainder of this thesis, the required value from this distribution table will be referred to as the periodogram multiple). Since the calculated average was computed to be .0334 and since the periodogram multiple for thirty-three periodogram values is approximately 6.04, we could assume that any value above .2 is significant at the 95% confidence level. This by itself would indicate that only the .015 freqency was significant. However, even though this frequency is highly significant, it may be the result of several other waves being superimposed on each other, or it may simply be pseudo in nature. If one discounts the impact which its high value has on the average, the twelve month wave would probably become significant. Therefore, since attempting to remove a wave of length thirty-three from the data would significantly affect the number of data points left for modeling, attempts were made to remove the twelve month wave from the data with hopes that the resulting equation would account for the thirty-three month wave.

Another tool for identifiying ARIMA models, is R and S array analysis. This methodology, which was developed by H. L. Gray, G. Kelly, and D. McIntire (Ref 3), uses

relationships between autocorrelations to identify ARMA models which could be used for further testing. A copy of both the high and low frequency R and S arrays are in Appendix F. Although the seasonality of twelve had not been removed from the data at this point, the R and S arrays indicated that possible nonseasonal differencing of the data may also be necessary. The R and S arrays suggested nonstationarity because the values in the first column of the low frequency S array tended to -2. Corrollary 3 in Gray, McIntire, and Kelly (Ref 3:30) states that:

> If $S_i(m)=-2$ when $f_n=p_n$ or $S_i(m)=0$ when $f_n=(-1)^n p_n$, then the process is nonstationary and the characteristic equation has at least one root of -1.

In other words, the R and S arrays indicated that at least one root of the equation may be on or near the unit circle. A complete listing of the computer generated output for this phase of model identification can be found in Appendix F.

Nonseasonal Differencing of the Data. Even though the initial periodogram indicated that seasonal differencing of twelve may be required, this phase of model identification did not incorporate seasonal differencing, that is, only nonseasonal differencing of order 1 has been accomplished on the data at this point.

Following nonseasonal differencing of the data, the

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previously identified steps of analysis were reaccomplished. Just as before, the simple and partial autocorrelations were computed and their respective plots analyzed. The autocorrelation plots are displayed in Figures 7 and 8. Except for a sinusoidal wave pattern of length twelve in the simple autocorrelation plot, nothing of significance was apparent, i.e. no significant lags except those associated with the sinusoidal pattern (lags 8,12, and 24) appeared to be observable. However, even though there appeared to be a significant sinusoidal pattern in the autocorrelations, the periodogram failed to detect any periodicity as significant.

Following the analyses of the autocorrelations, the R and S arrays were examined. This analysis suggested that an ARIMA(4,1,1) model may provide an adequate fit to the data. This possibility was then further tested by use of the D statistic (Ref 5:22-24). This statistic measures agreement with the proper pattern for the stationary ARMA(p,q) process. As expected, based on the R and S array analysis, this statistic also indicated that the proposed ARIMA(4,1,1) model may be adequate.

Finally, the maximum likelihood estimators were calculated for the proposed model, with the resulting equation being:

$$Z_t = .5327Z_{t-1} + .1572Z_{t-2} + .0129Z_{t-3} - .3516Z_{t-4} + A_t - .7660A_{t-1}$$
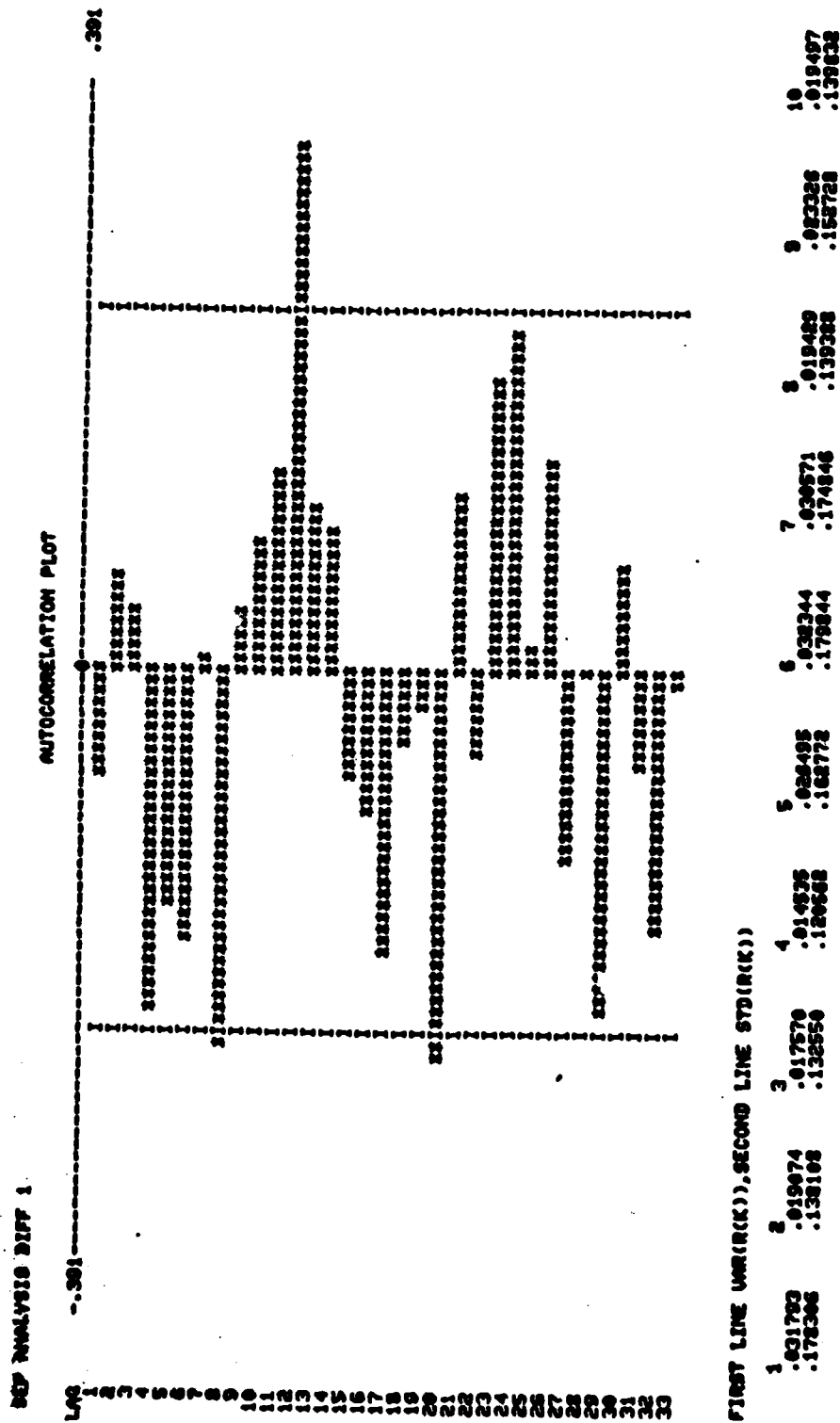
FIGURE 7. Autocorrelation Plot for Nonseasonally Differenced
Separation Data

36
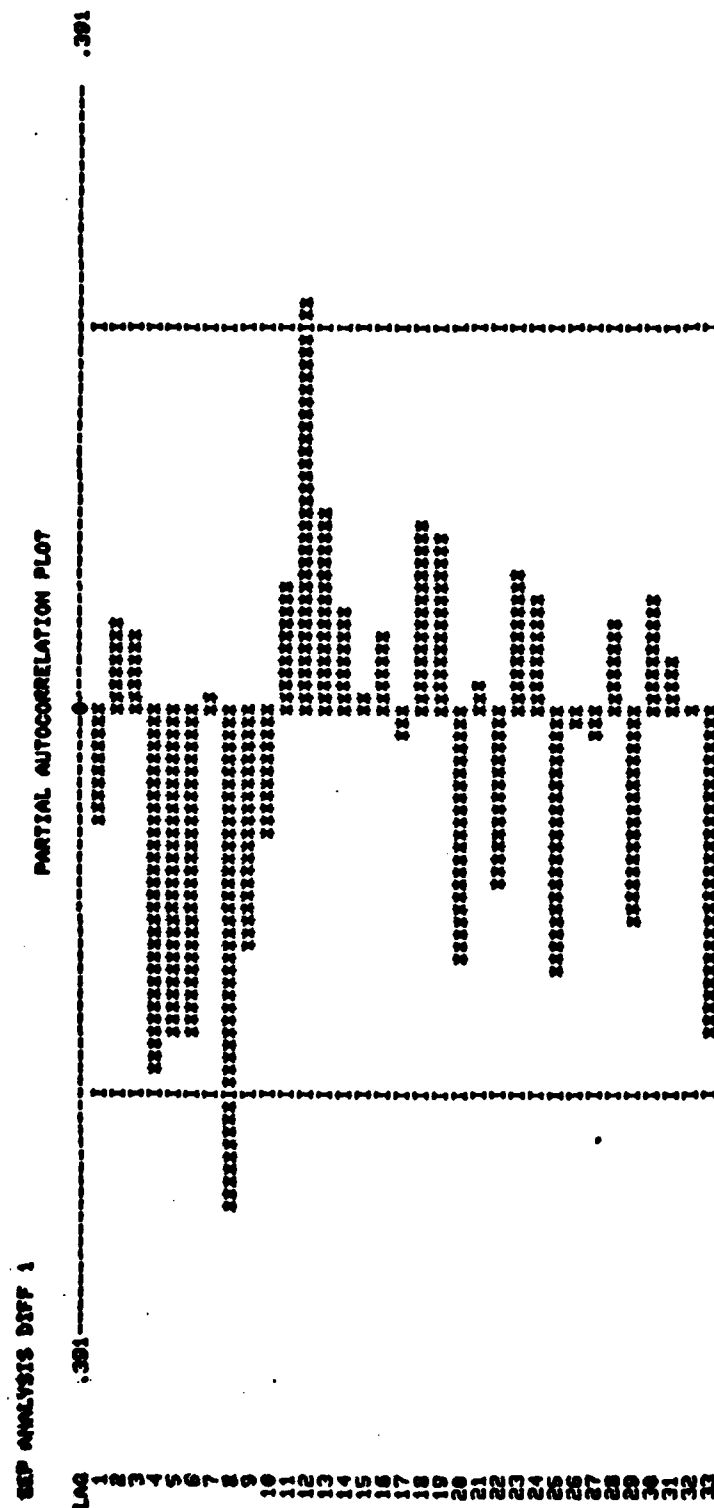
FIGURE 8. Partial Autocorrelation Plot for Nonseasonally
Differenced Separation Data

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$$Z_t = X_t - X_{t-1} - .0003$$

where X_t is the undifferenced data, .0003 is the mean of the differenced data, and A_t is the random shock of the moving average process. The mean .0003 must be removed from the data since the maximum likelihood estimators of the coefficients are calculated with the mean removed. Finally, since Z_t is differenced data, the equation of undifferenced data is:

$$(1-B)(1-.5327B-.1572B^2-.0129B^3+.3516B^4)Y_t = A_t - .7660A_{t-1}$$
$$(1-1.5327B+.3755B^2+.1443B^3+.3645B^4-.3516B^5)Y_t = A_t - .7660A_{t-1}$$

$$Y_t = X_t - .0003$$

where X_t is the undifferenced data and .0003 is the mean of the difference data.

After the calculations were completed, a residual analysis of the model was performed. A complete list of the computer generated output 'for this phase of model identification can be found in Appendix G.

<u>Residual Analysis of ARIMA(4,1,1)</u>. As with any forecasting model, the adequacy of fit must be tested. In time series analysis, this entails a thorough examination of the residuals for signs of significant autocorrelations

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SEP ANALYSIS

ARIMA(4,1,1)

──────── 5% KS BAND

- - - - - - - 25% KS BAND
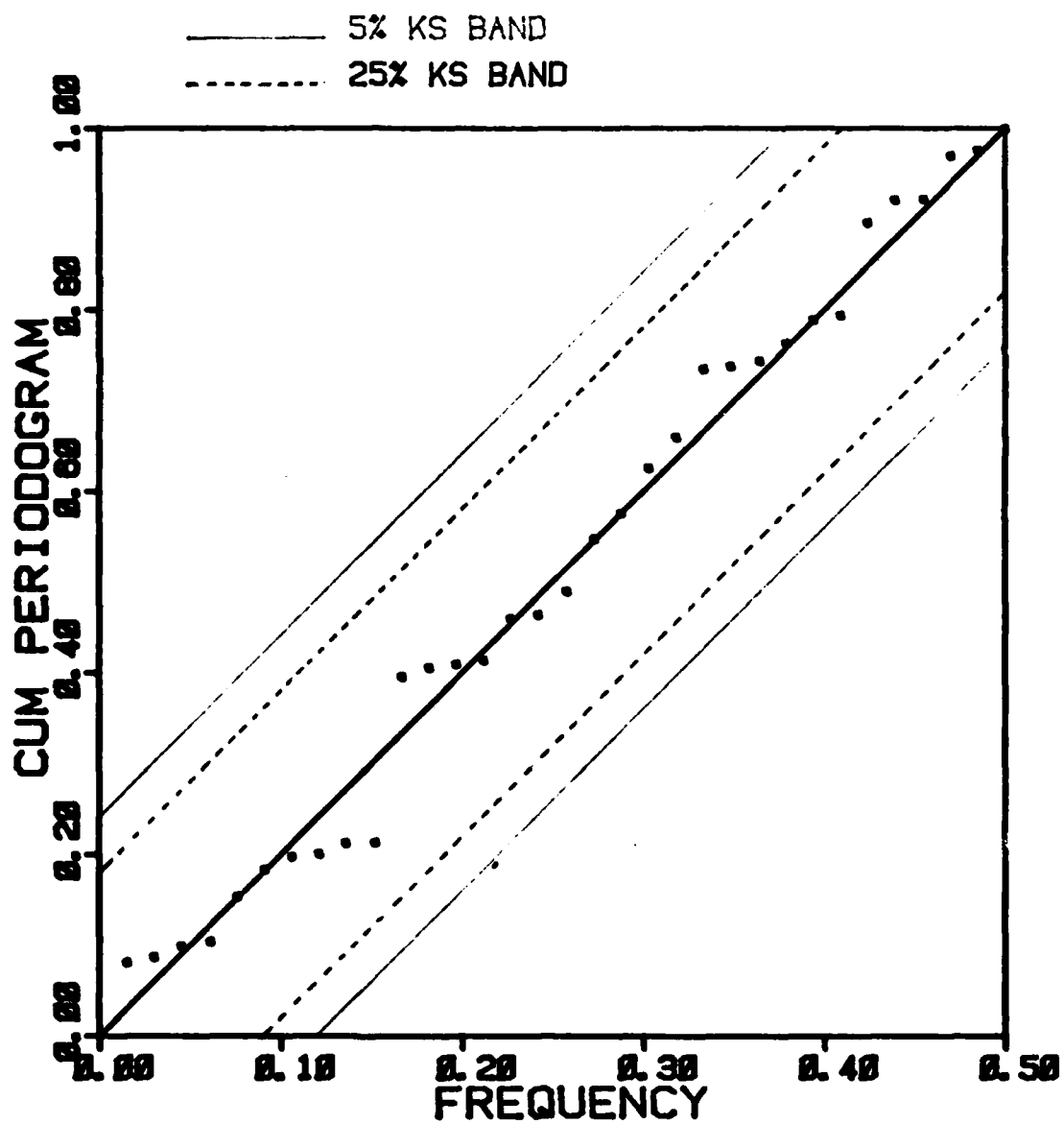
FIGURE 9. Cumulative Periodogram for ARIMA(4,1,1)

or frequencies.

Just as with the first phase of model identification, residual analysis's first phase is to compute the autocorrelations of the estimated residuals. This was accomplished by using the same IMSL subroutine that calculated the autocorrelations of the raw data. In this analysis, an assessment of the autocorrelations suggested that there may be an unaccounted-for wave of length twelve still in the data. Therefore, even if the remaining tests prove negative, attempts should be made to remove this frequency.

The next phase, was to examine the Portmanteau Lack of Fit Test value for indications of inadequacy. This value, takes the estimated autocorrelations as a whole to test for indications of model inadequacy (Ref 2:289-291). Once the value has been calculated, it is then compared against the Chi-Square Distribution with K-p-q degrees of freedom, where p and q are the orders of the ARMA process and K is the number of autocorrelations used in the calculation of the Portmanteau value, which has been labeled Q. In this residual analysis, the value of Q was calculated to be 32.35, with the associated Chi-Square statistic for twenty-eight degrees of freedom being approximately 41.34 at the 95% confidence level. Therefore, this test did not indicate model inadequacy.

The last phase of model inadequacy testing involves

the graphing of a cumulative periodogram. Figure 9 displays this graph. Except for jumps between points, there does not appear to be any sign of the model not accounting for significant periodic characteristics in the series.

In summary, even though the cumulative periodogram and the Portmanteau Lack of Fit test did not indicate model inadequacy, additional analysis was accomplished on the data so that the periodicity of twelve could be removed from the data. Appendix H contains the computer generated autocorrelation table and other test statistics for this residual analysis.

Seasonal Differencing of Twelve. After completing the residual analysis of the ARIMA(4,1,1) model, the original data was seasonally differenced by order one and of length twelve. This data was then used for additional model identification. A complete list of the computer output for this phase is in Appendix I.

Again, the autocorrelations were first examined for signs of differencing and/or possible model identification. As can be seen from their plots, Figures 10 and 11, the autocorrelations have indications of nonstationarity. This hypothesis was later reinforced when examination of the R and S arrays also indicated the need for nonseasonal differencing.

Nonseasonal Differencing. After nonseasonal
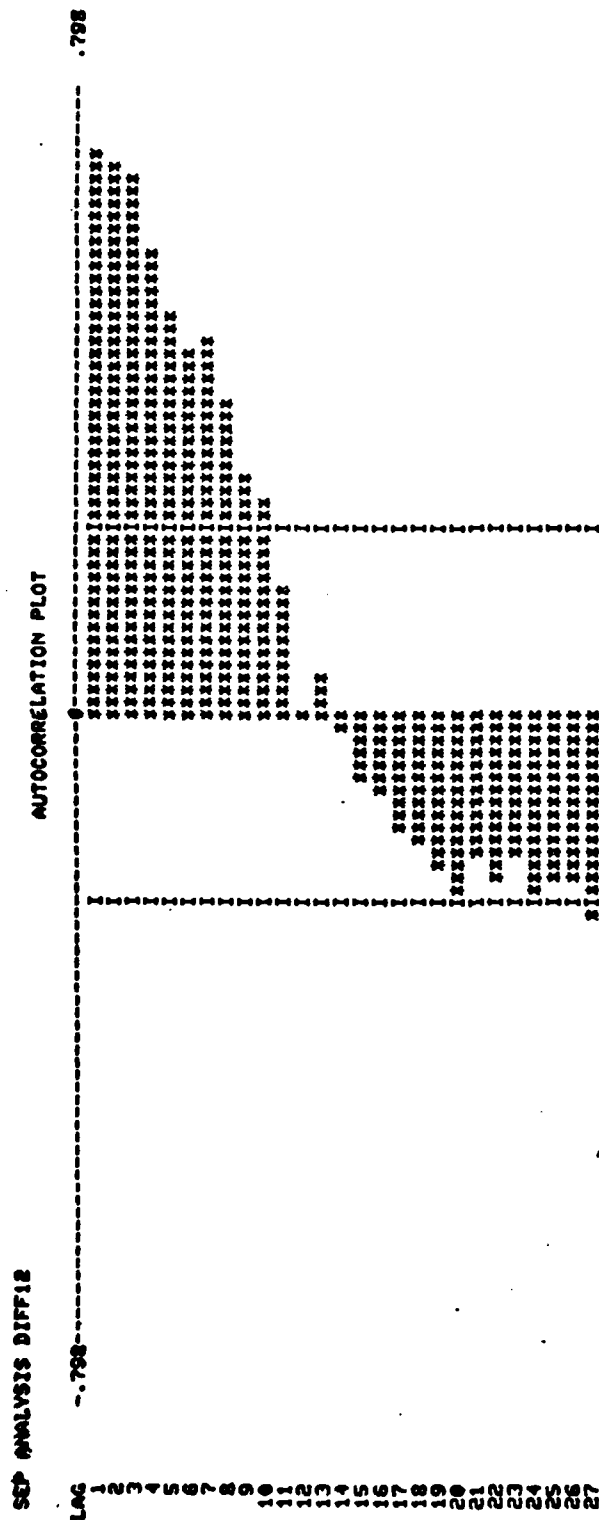
FIGURE 10. Autocorrelation Plot of Seasonally Differenced
Separation Data

42
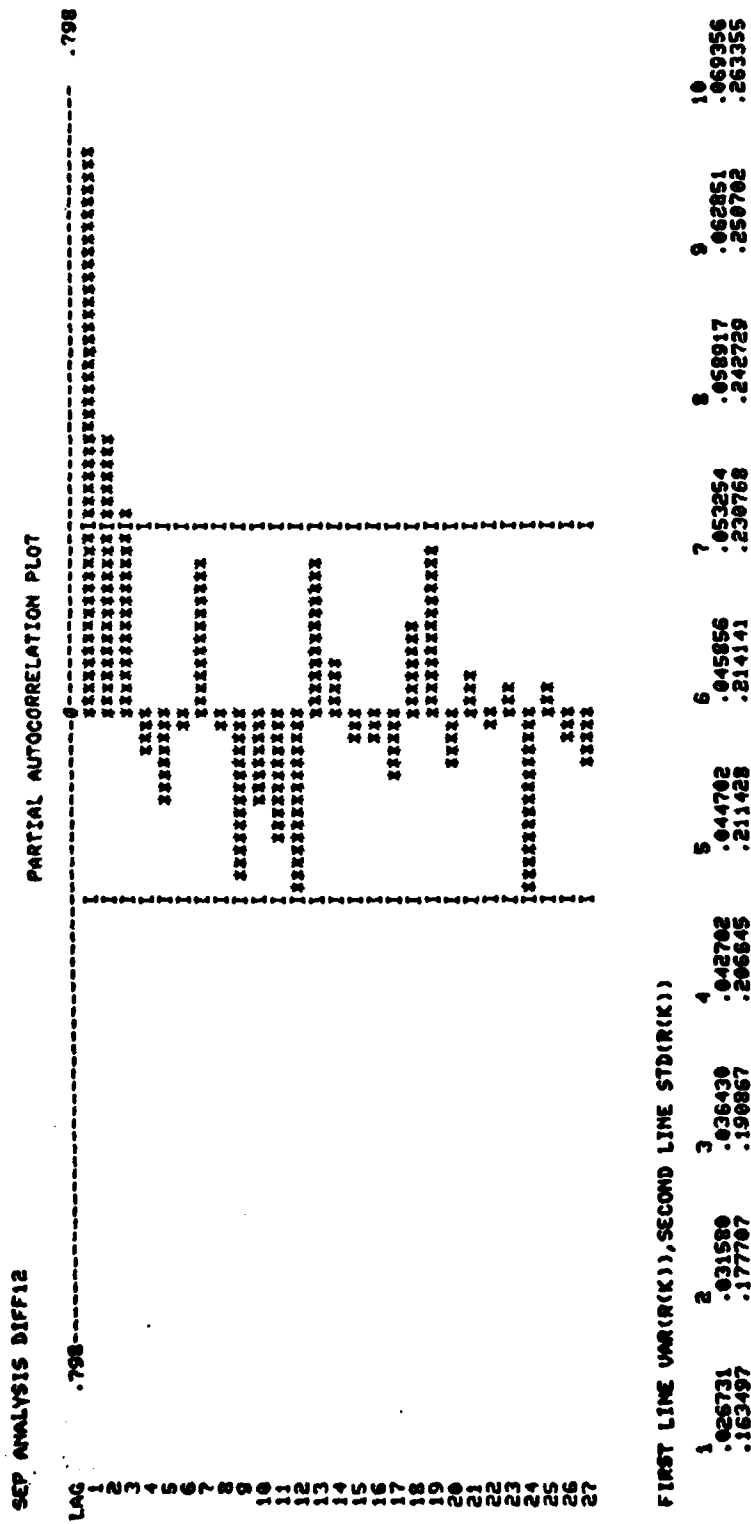
FIGURE 11. Partial Autocorrelation Plot of Seasonally
Differenced Separation Data

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differencing of the seasonally differenced data was completed, the autocorrelations, periodogram, and R and S arrays were computed. As expected, based upon the previous analysis, no additional differencing was indicated. Also, examination of the autocorrelations indicated that an autoregressive process of order 2 may be adequate. Moreover, both the low and high frequency R and S arrays had strong indications of an AR(2) process having an adequate fit. Finally, the calculation of the D statistic also substantiated a possible AR(2) process. Therefore, the parameters for this model were calculated and the model was examined for inadequacies.

Parameter Estimation. Using the IMSL catalogued program FTMXL, the maximum likelihood estimates of the coefficients were computed, with the resulting equation being:

$$Z_t = -.6008*Z_{t-1} - .3555*Z_{t-2} + A_t$$

However, it must be remembered that Z_t has been both seasonally differenced by twelve and nonseasonally differenced by an order of 1. Taking this into consideration, the equation of nondifferenced data becomes:

$$(1-B^{12})(1-B)(1+.6008B+.3555B^2)Y_t = A_t$$

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Multiplying out the terms results in:

$$(1-B-B^{12}+B^{13})(1+.6008B+.3555B^2)Y_t =A_t$$

$$(1-.3992B-.2453B^2-.3555B^3-B^{12}+.3992B^{13}+.2453B^{14}+.3555B^{16})Y_t =A_t$$

$$Y_t =X_t +.0032$$

where X_t is the undifferenced data and .0032 is the mean of the differenced data. Again, as mentioned before, the mean of the differenced data must be removed from the data since the program for calculating the maximum likelihood coefficients removes the mean from the data prior to performing its computations. Therefore, when using the estimated equation for predicting, the mean must first be removed from the data and then added back into the predictions following all computations.

Residual Analysis of ARIMA(2,1,0)*(0,1,0)$_{12}$. As before, the initial step for residual analysis is to compute the autocorrelations for the estimated residuals. The residuals are estimated by subtracting the predicted from the actual. Just as with the previously examined ARIMA(4,1,1) model, the autocorrelation plots had a significant autocorrelation at lag 12. Therefore, this was noted so that additional attempts could be made to remove the significant autocorrelation following the completion of this residual analysis.

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The next step in the analysis was to examine the Portmanteau Lack of Fit value. For this model, Q was calculated to be 16.66, with the associated Chi Square statistic for twenty-five degrees of freedom being 37.65 at the 95% confidence level. Therefore, this test failed to identify inadequacy in the proposed model.

Finally, the cumulative periodogram values were computed and graphed. This graph is shown in Figure 12. As can be seen, there are no signs of model inadequacy. In fact, this model's cumulative periodogram appears to have a better fit than does the one associated with the ARIMA(4,1,1). However, this would not be unexpected since this model can be viewed as an overfit when compared with the previous model. A complete list of this residual analysis's computer output can be found in Appendix J.

ARIMA(2,1,0)*(1,1,0)$_{12}$ Model. Since the autocorrelation plots of the ARIMA(2,1,0)*(0,1,0)$_{12}$ model indicated a significant value at lag 12, a twelfth order autoregressive coefficient was added to the model. This change resulted in the following equation:

$$(1-B^{12})(1-B)(1+.5294B+.2621B^2)(1+.3742B^{12})Y_t = A_t$$

Multiplying terms yields:

SEP ANALYSIS

ARIMA(2, 1, 0) * (0, 1, 0)$_{12}$

——————— 5% KS BAND

- - - - - - - - 25% KS BAND
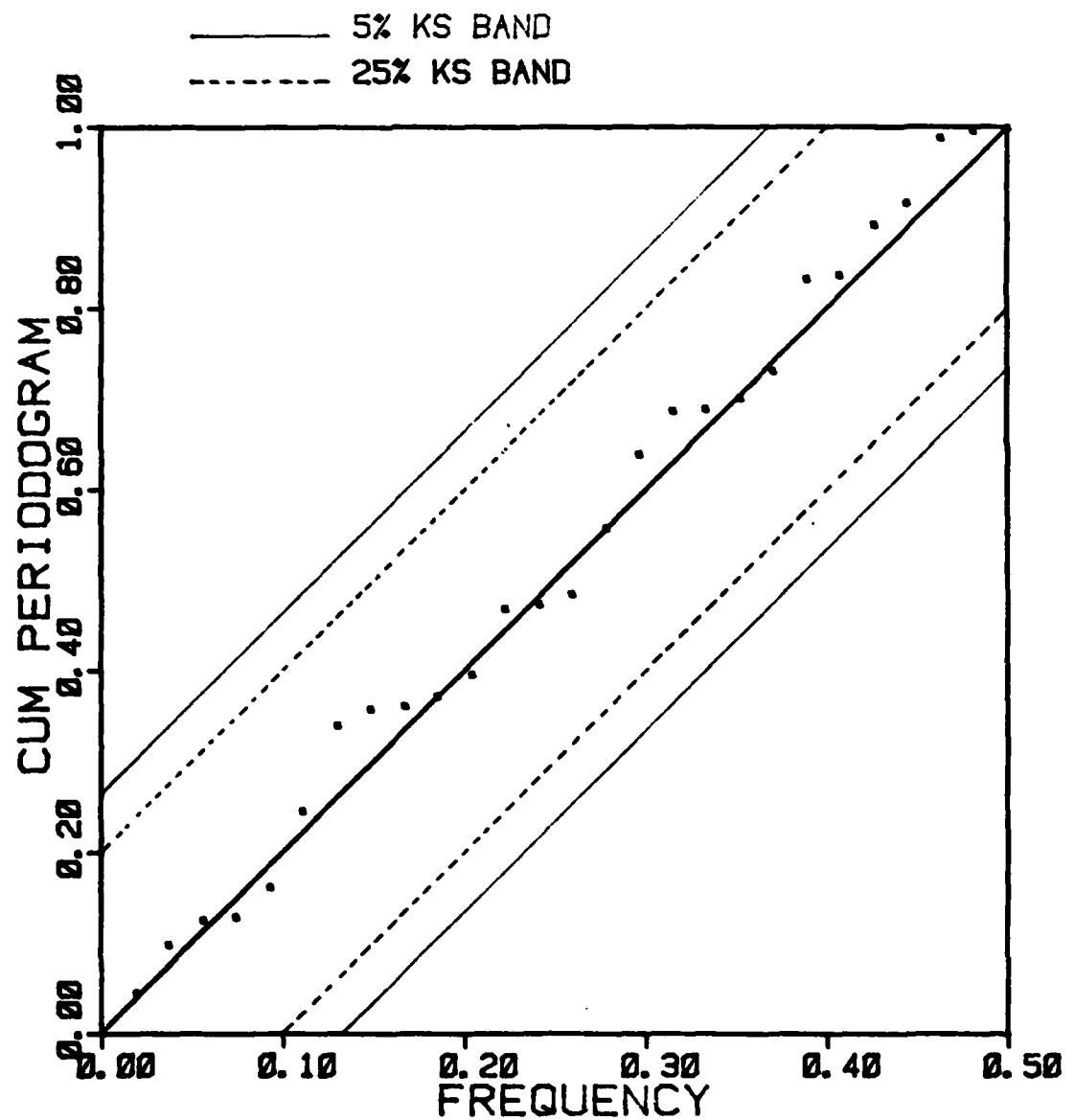
FIGURE 12. Cumulative Periodogram for ARIMA(2,1,0)*(0,1,0)$_{12}$

$$(1-.4706B-.2673B^2-.2621B^3-.6258B^{12}+.0324B^{13}+.1673B^{14}+.1640B^{15}-.3742B^{24}+.3001B^{25}-.0240B^{26}-.0981B^{27})Y_t=A_t$$

$$Y_t=X_t+.0032$$

where X_t is the undifferenced data and .0032 is the mean of the differenced data.

Residual Analysis of ARIMA$(2,1,0)*(1,1,0)_{12}$. An examination of the autocorrelation plots, Figures 13 and 14, indicated that for the first time the autocorrelations failed to exceed an estimated 2 standard error band. Therefore, it appeared that the estimated residuals were white noise.

Further, examination of the Portmanteau Lack of Fit value also indicated that there were no signs of inadequacy, i.e., the value of Q was calculated as 19.43 with the associated Chi-Square statistic with alpha equal to .05 and twenty-five degrees of freedom being 37.65.

Finally, the cumulative periodogram, Figure 15, was analyzed for signs of unmodeled freqencies. As with the other models, all points fell well within both the 5% and 25% error bands. Therefore, based upon the cumulative periodogram, the Portmanteau Lack of Fit test, and a subjective assessment of the autocorrelations, there do not appear to be any significant signs of model inadequacies.
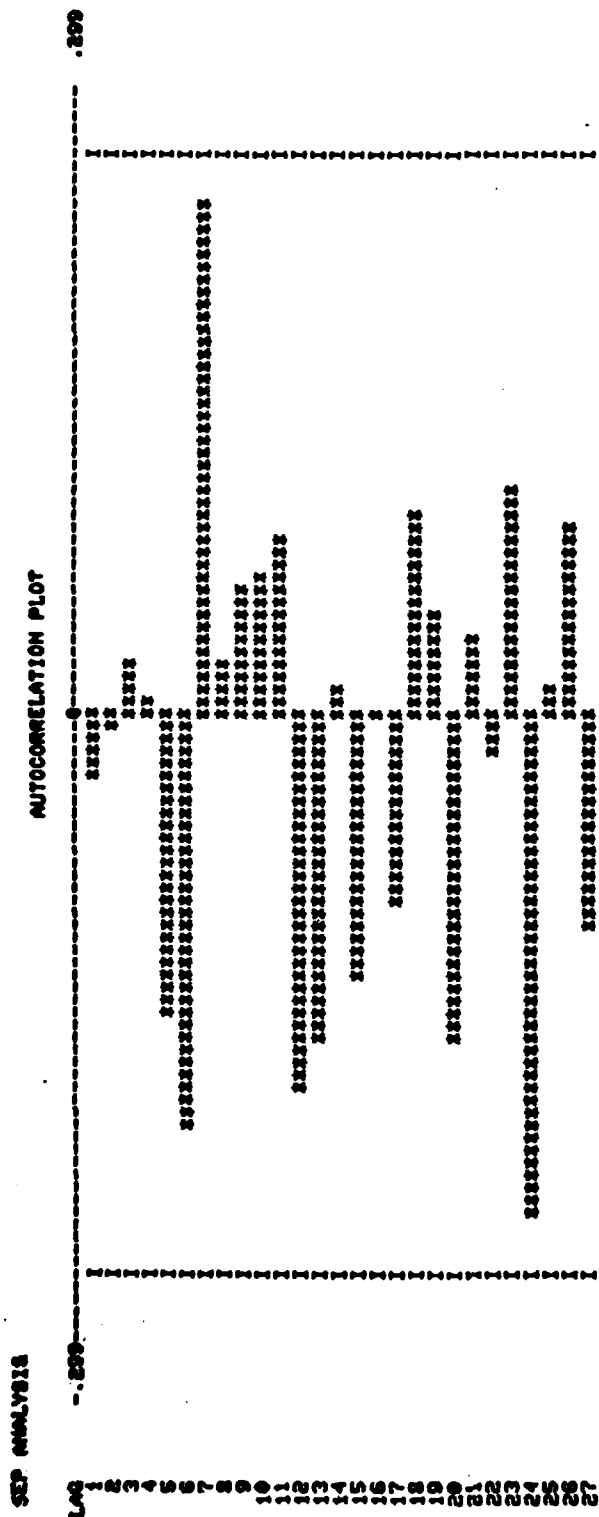
FIGURE 13. Autocorrelation Plot of the Residuals
from the ARIMA$(2,1,0)*(1,1,0)_{12}$
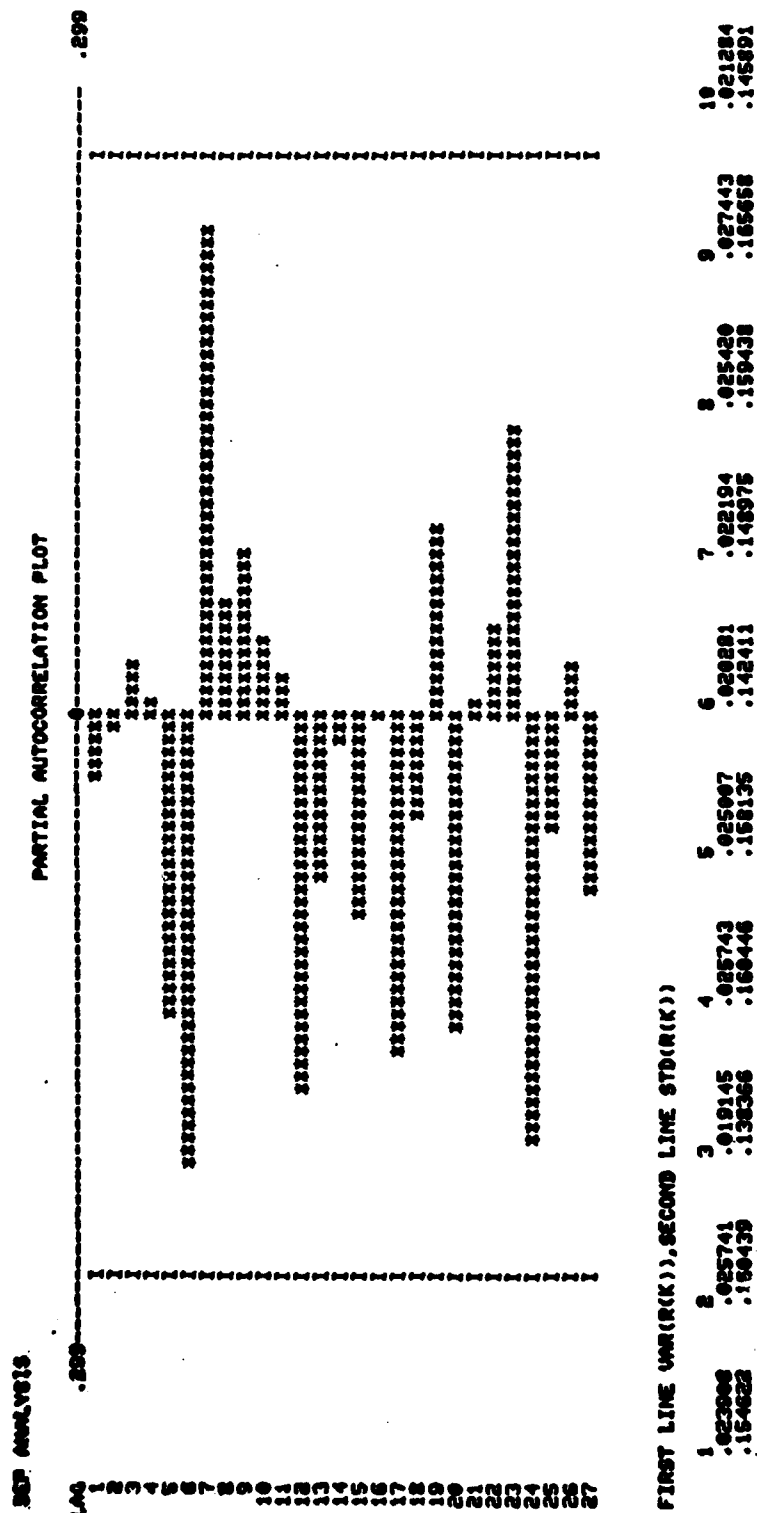
FIGURE 14. Partial Autocorrelation Plot of the Residuals
from the ARIMA$(2,1,0)*(1,1,0)_{12}$

SEP ANALYSIS

ARIMA $(2, 1, 0) * (1, 1, 0)_{12}$

——— 5% KS BAND
········ 25% KS BAND
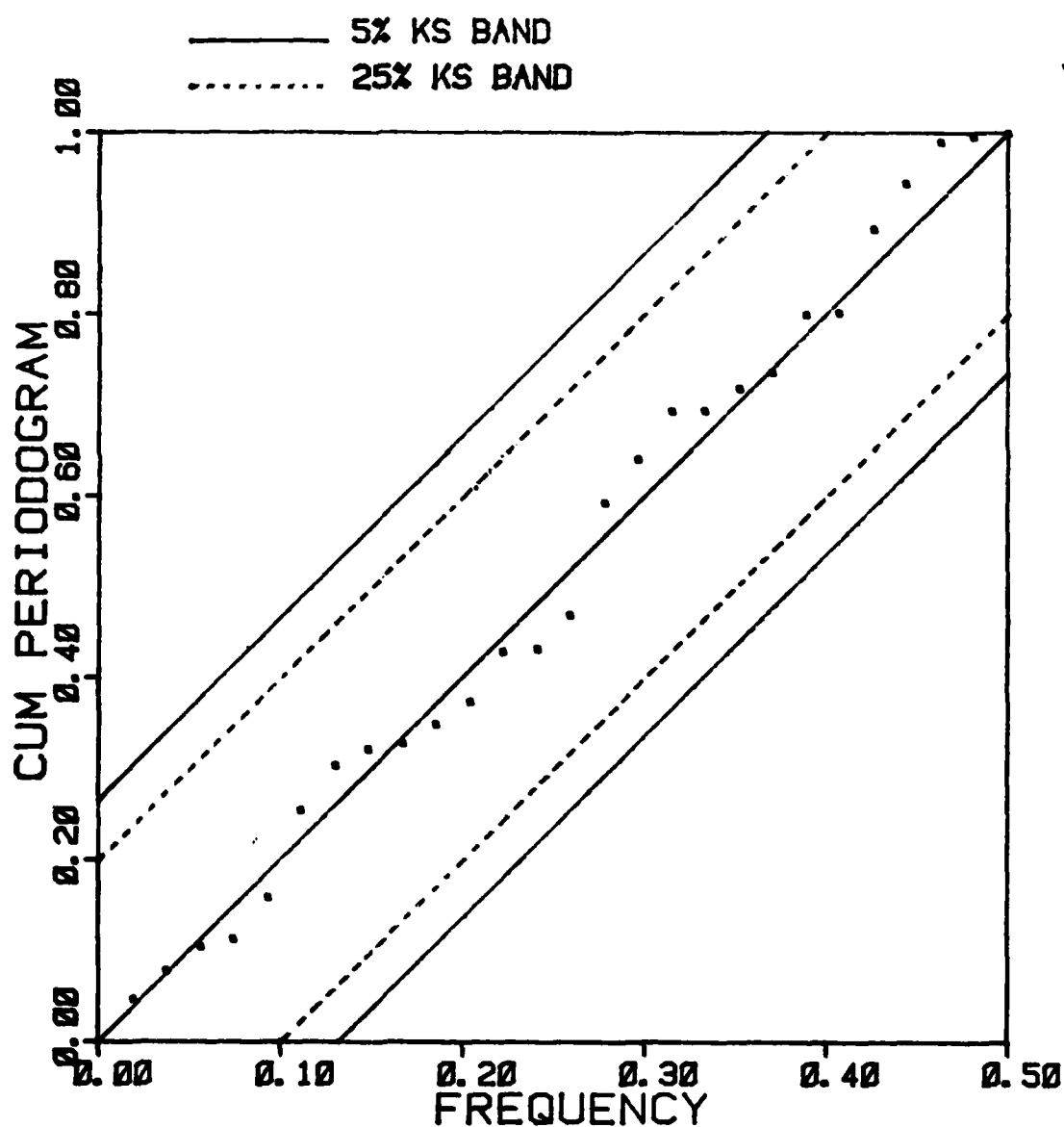
FIGURE 15. Cumulative Periodogram for ARIMA$(2,1,0)*(1,1,0)_{12}$

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Conclusions

Although the ARIMA$(2,1,0)*(1,1,0)_{12}$ adequately fits the data, there still appears to be numerous unaccounted for frequencies. These periodicities, which are not statistically significant, have an observable stairstep pattern. See Figure 15. Therefore, attempts to forecast will in all probability result in short term errors of a magnitude which may be unacceptable. However, when the loss projections are taken as a whole, the magnitude of the overall error may be reduced to the point where the resulting prediction error may be acceptable. Keeping this in mind, the following table, which compares the FY82 actual values with the FY82 time series prediction, was prepared:

Table VII

		Time Series FY82 Prediction Error (Data as of 30 Sep 81)		
Month	Actual	FY82 Pred	% Error	FY83 Pred
Oct	.193	.274	+42.0	.203
Nov	.193	.136	-29.5	.058
Dec	.197	.207	+ 5.1	.120
Jan	.165	.149	- 9.7	.067
Feb	.159	.116	-27.0	.031
Mar	.137	.131	- 4.4	.048
Apr	.145	.120	-17.2	.032
May	.141	.133	- 5.7	.053
Jun	.231	.160	-30.7	.081
Jul	.219	.291	+32.9	.201
Aug	.285	.257	- 9.8	.177
Sep	.221	.186	-15.8	.107
Total	2.286	2.160	- 5.5	1.178
Number	1137	1074	-63	587

The total prediction error of 63 (1137-1074) equates to a 5.5% inaccuracy. However, when the FY83 estimate (predicting two years out) was examined, the downward trend in losses continued to the point where the model could not be considered reliable. In other words, since there were already more than 400 approved career separations in-system for FY83 as of 30 September 1982, it would seem unrealistic to assume that only 175 additional career separations would be submitted throughout FY83. In addition, these in-system numbers do not include the end of obligation losses which would also be included in this category.

As a final note, when the prediction was extended into FY84, several months had negative separation rates. In other words, the downward trend which the ARIMA$(2,1,0)*(1,1,0)_{12}$ had modeled was not being reversed, i.e., the true long term trend was not being captured. Therefore, the time series data requires additional analysis before long term trend predictions should be attempted. However, this is not to say that current fiscal year loss rates could not be calculated for use as a comparison tool with other prediction techniques such as regression analysis.

Recommendations

The time series analysis of separation data indicated

an area of research which I feel deserves additional attention. As observed in the initial periodogram, there appears to be a long term wave for which differencing could not account. Therefore, a simple Fourier Analysis of the data was accomplished. This analysis indicated that a wave of length 64 or 65 may be present in the data. This hypothesis is also strengthened when one subjectively assesses the plot of the separation data (Figure 16). As can be seen, the rates had been increasing through mid-1979, at which point they began decreasing. Since it is both unrealistic and infeasible to assume that the rates will continue to decrease as the FY83 and FY84 time series predictions suggest, one would expect that they would have to bottom out and then begin to either stabilize or climb. To express this in another way, during FY78 and FY79, when the economy was significantly better than today, those individuals who were not quite satisfied with the service were able to easily obtain employment outside the Air Force. Essentially, those individuals who were sitting on the fence tended to jump to the private sector. However, when economic conditions rapidly changed during the years following 1979, jobs became harder to obtain and the retention rates improved. This change, therefore tended to restrict one's propensity to separate from the service. Therefore, it could reasonably be expected that when economic conditions improve, separation rates will

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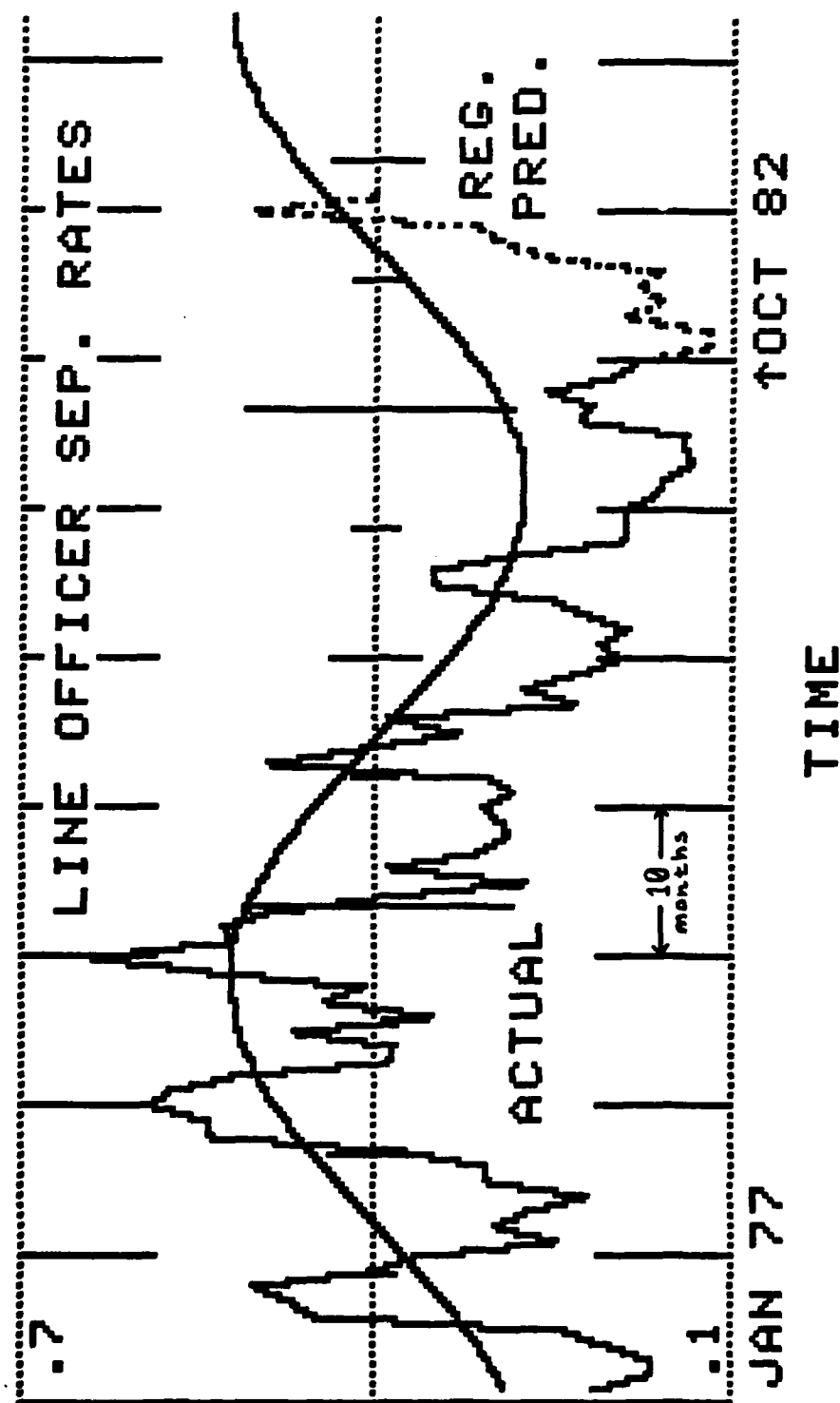
FIGURE 16. Long Term Trend Analysis of Separation Data

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significantly increase.

As everyone knows, to accurately predict such a change
is difficult if not impossible. However, there are
indications that hint at when the influence of economic
conditions change the separation patterns of Air Force
officers. One easily obtained indicator is the number of
DOSs in system. In essence, DOSs in system tends to be a
type of economic barometer which measures the impact which
the economy is having on one's propensity to separate.
Therefore, since the FY83 number in system is greater than
last year's (as measured at equivalent points in time), it
could be assumed that the economic conditions which
influence one's propensity to separate may be improving.
This hypothesis can be graphically supported, Figure 16, by
adding the regression analysis prediction to the end of the
separation trend chart. In addition, if one extends the
estimated 64 month wave beyond the most recent observation,
it can be seen that this wave and the regression analysis's
prediction trend patterns tend to coincide. Therefore, my
recommendation is to reaccomplish the time series analysis
but begin with a Fourier Analysis which would identify and
calculate long term waves within the data. These
calculated waves could then be removed from the data so
that a conventional time domain analysis could be employed.
Once this analysis is completed, the long term wave could
be projected into the future and then simply added to the

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predictions provided by the time series model.

IV. Regression Analysis of Retirement Application Patterns

Methodology

The same SPSS regression package that was used to model separation trends was also used to model retirement application patterns. Basically, it was hoped that the same regression methodology could be used to predict retirement loss patterns. Also, just as with the separation data, the primary source of retirement application information was the FYCOPS report (Appendix A).

Data Base Configuration

In the previous discussion of officer separations, it was noted that individuals are required by Air Force policy to submit an application for separation at least 180 days prior to the date on which they request to be separated. For those officers who are retirement eligible, a similar type of policy is applicable. This policy states that all retirement eligible officers must submit their retirement applications at least 90 days prior to a requested retirement date. This 90-days notice is required so that all necessary paperwork and mandatory physicals can be completed prior to the month in which the retirement is to become effective. Therefore, just as with DOSs in system for separations, the number of approved and in-system

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retirements was used as the primary independent variable in the retirement analysis.

In addition to voluntary retirements, a large number of the losses which occur within a given fiscal year are in a category commonly referred to as mandatory retirements. This type of retirement is comprised of three subcategories: disability, promotion failure, and high year tenure retirements. Even though mandatory loss patterns are different from voluntary retirement patterns, the system still records the anticipated retirement date several months prior to the month in which the retirement is scheduled to occur. The high year tenure retirement is normally recorded in the system twelve months prior to the required retirement date, while the promotion failure retirement is usually entered into the system immediately following the promotion board results. Promotion failure retirements are required by Air Force policy to occur within 180 days following the release of promotion board results. The disability retirement advance notification is, as one would expect, very little. However, since the number of disability retirements which occur within any given month are usually less than ten, their impact is negligible. Moreover, since the number of mandatory retirements which occur within any individual category is small (normally less than ten), the sum of all three categories was used as the second independent variable

instead of using each subcategory as a separate variable.

The data base structure designed for this analysis is essentially the same as that which was used for the separation data bases, i.e., there are twelve data bases each comprised of information about the number of applications approved and in-system a given number of months out. As with the separation files, the first column of information in each data base is the dependent variable accomplished retirements. The second column of information in the retirement files is the independent variable voluntary retirements in-system. The third column in each data base is the previously discussed sum of all mandatory retirements. The fourth column in every file is a variable which time orders the observations. This additional variable was required since many of the data bases' residuals were positively autocorrelated. Also, some of the data bases required the addition of an indicator variable which was labeled policy. This variable always appears as the fifth column in those data bases which required the variable. In essence, this indicator variable pertains to those months in which promotion failure losses had a significant effect on retirements. More will be discussed about this variable in the regression results section.

The names used for the retirement files are RET1 through RET12. The number used in each name has the same

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connotation as that associated with the separation files, i.e., RET1 contains data for one month out, RET2 contains data for two months out, etc. Since a listing of each data base is contained in the SPSS output (Appendix K), a separate appendix containing only data base information is not included.

Finally, the amount of historical information used in the analyses was restricted by the amount of historical data available. Initially, the data bases included data which had been recorded subsequent to September 1978. However, after the initial regression analyses were completed, the data bases were restricted to that loss information which had been recorded after 30 September 1979. In summary, the preliminary analyses indicated that several promotions/policy changes which occurred prior to FY80 had significantly affected the pattern of retirement applications.

Regression Results

Using the maximum number of observations, with the most recent being May 1982, the R^2 statistic ranged from .99 for one month out (RET1) to .42 for twelve months out (RET12). The adjusted R^2 ranged from .99 for RET1 to .38 for RET12. A summary listing of these and other major statistics can be found in Tables VIII and IX.

Like the separation analyses which identified a

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TABLE VIII

Regression Summary Statistics (Part A) Monthly Observations through May 82				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
RET1	33644.362	.99960	.99957	2.0107
RET2	7514.959	.99827	.99814	1.6157
RET3	3431.567	.99632	.99603	1.7880
RET4	849.546	.98569	.98453	1.4611
RET5	441.352	.97353	.97132	1.2711
RET6	192.030	.94273	.93782	2.3546
RET7	48.038	.81830	.80827	1.6124
RET8	23.951	.70546	.67600	1.5596
RET9	21.961	.59416	.56711	1.5595
RET10	20.513	.58587	.55731	1.3553
RET11	20.342	.58384	.55514	1.2970
RET12	9.788	.42031	.37736	1.4614

TABLE IX

		VARIABLE F STATISTICS		
		Regression Summary Statistics (Part B) Monthly Observations through May 82		
FILE	# OF OBS	VOL RETS	MAND RETS	TIME
RET1	44	42808.75	6177.21	15.61
RET2	43	9288.48	1391.88	29.73
RET3	42	4207.24	766.77	40.43
RET4	41	1051.30	164.27	35.14
RET5	40	553.09	182.46	36.83
RET6	39	231.78	26.59	13.28
RET7	36	113.00	9.23	8.75
RET8	34	42.16	10.18	4.60
RET9	33	31.36	7.36	N/A
RET10	32	29.33	8.39	N/A
RET11	32	29.76	8.55	N/A
RET12	30	17.57	4.97	N/A

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significant drop in the R^2 statistic after SEP6, the retirement's R^2 statistic also decreased significantly. It was determined that this decrease was a result of two things. First, it was felt that this decrease reflected the methodology's inability to account for the variability in the dependent variable as the time span between the application submittal month and the month of retirement increased. Second, and probably most significant, it was felt that a large portion of the decrease was a result of the data bases not containing a variable which reflected a change in policy or the release of promotion board results (policy variable was not used in the initial analysis). Therefore, these two possible explanations were noted for future analysis. This second hypothesis resulted in the addition of the fifth variable policy which was previously noted.

In addition to the R^2 analysis of the regression results, the F statistics were found to be significant at the 95% level for all twelve data bases. Further, examination of the F statistics for both the voluntary and mandatory retirement variables indicated that they too were significant at the 95% confidence level for all data bases. However, the time variable, which was used in the initial analyses, was not found to be significant for the data bases RET9 through RET12.

Finally, the Durbin-Watson values were checked for

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signs of autocorrelation. This analysis indicated that several data bases had indications of positive autocorrelation. In essence, if the error terms in the regression model are positively autocorrelated, then the use of the regular least squares procedure has four important consequences. These are summarized below (Ref 7:352):

1. The regular least squares regression coefficients are still unbiased, but no longer have the minimum variance property and may be quite inefficient.

2. MSE may seriously underestimate the variance of the error terms.

3. $s(b_k)$ calculated according to the regular least squares procedure may seriously underestimate the true standard deviation of the estimated regression coefficient with that procedure.

4. The confidence intervals and test using the t and F distributions are no longer strictly applicable.

Therefore, attempts should always be made to remove signs of autocorrelation.

Initially, it was believed that the positive autocorrelation was being caused by the residuals which were associated with the FY79 data. A subjective assessment of these error terms indicated that in most data bases, the FY79 error terms where usually positive and significantly larger than those following fiscal year 1979. This difference was believed to be due to both the promotion boards which were held in FY79 and the condition

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of the private sector economy. Therefore, since a comparison of the FY79 data points with subsequent residuals indicated that they were outliers, they were removed from the files, i.e., only data recorded following 30 September 1979 were used in future analyses. Also, in addition to the FY79 observation restriction, all data bases had the indicator variable policy added so that those months which had promotion failure losses or a retirement policy change could be identified.

Following the removal of the FY79 observations and the addition of the policy variable, all regression analyses were reaccomplished. These regression results were significantly different from those which were originally obtained. The adjusted R^2 statistics ranged from .99 to .82 instead of .99 to .38. Moreover, the remaining statistics (Tables X and XI) also had considerably different results. The F statistic for mandatory retirements in data bases RET8 and RET9 failed to pass a 95% confidence level test, and the F statistic for time was below the 95% confidence level test in files RET1, and RET6 through RET12. In addition, the just added policy variable was statistically significant in the data bases RET6 through RET12. The policy F statistics indicate that in those data bases which predict retirements more than five months in advance, policy changes/promotion board results have a significant impact on the number of retirements

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TABLE X

Regression Summary Statistics (Part A) Monthly Observations, Oct 79 through May 82				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
RET1	19533.046	.99952	.99947	1.9993
RET2	5248.449	.99822	.99803	1.7528
RET3	1749.056	.99469	.99412	1.6386
RET4	794.176	.98838	.98714	1.4496
RET5	415.041	.97801	.97565	1.9528
RET6	165.125	.94650	.94077	1.8236
RET7	70.470	.88675	.87417	2.1492
RET8	61.500	.87648	.86223	2.0095
RET9	45.535	.84010	.82165	1.5548
RET10	71.942	.89248	.88008	1.6763
RET11	68.372	.88750	.87452	1.5227
RET12	84.348	.91009	.89330	1.8164

TABLE XI

		ASSOCIATED VARIABLE F STATISTICS			
		Regression Summary Statistics (Part B) Monthly Observations, Oct 79 through May 82			
FILE	# OF OBS	VOL RETS	MAND RETS	POLICY VAR	TIME
RET1	32	34135.45	3099.75	N/A	2.54
RET2	32	9095.94	772.60	N/A	4.88
RET3	32	2998.19	299.75	N/A	8.57
RET4	32	1455.80	119.25	N/A	12.01
RET5	32	633.04	65.26	N/A	4.11
RET6	32	253.83	22.99	5.34	N/A
RET7	31	168.68	5.27	7.23	N/A
RET8	30	46.04	1.48	25.54	N/A
RET9	30	33.93	2.58	25.18	N/A
RET10	30	49.84	5.29	69.19	N/A
RET11	30	47.33	6.45	69.58	N/A
RET12	28	55.44	18.07	132.54	N/A

which will ultimately occur. Also, the decreasing F value for the time variable indicated that the decreasing retirement pattern which was prevalant when the FY79 observations were in the data bases is not as significant as before.

When the Durbin-Watson values were checked, it was found that those files whose residuals indicated autocorrelation had changed somewhat. Instead of nine files having indications of autocorrelation, only four data bases' Durbin-Watson value were either in the inconclusive or the positive autocorrelation region. However, this decrease in positively autocorrelated data bases was expected following the removal of the FY79 observations' positive residuals. However, since no obvious reason for the remaining positive autocorrelation was apparent, additional analysis was needed in hopes of removing the remaining signs of positive autocorrelation. The steps involved in this analysis are discussed below.

Autocorrelation Analysis. Since each data base's composition is basically the same, it was felt that by thoroughly analyzing just one data base, a hypothesis for the autocorrelation might be discovered. Therefore, since ET4's Durbin-Watson statistic had the lowest value of all twelve data bases, this file was chosen for the extensive autocorrelation research. A complete discussion of this analysis can be found in Appendix L.

In summary, it was felt that positive autocorrelation was being caused by retirement application patterns which occur within fiscal years. It was found through a residual plot analysis, that except for FY81 the residuals tended to change from negative to positive as the fiscal year progressed. Further, it was felt that the FY81 residual pattern was a result of the large pay increase which was given in October 1981. Although this hypothesis could be modeled, a degree of uncertainty would still exist because the size of RET4 precluded positive identification of the cause. Therefore, retirement predictions produced with this methodology should include a list of caveats associated with positive autocorrelation.

After the completion of RET4's residual analysis, two additional months of observations were made available. Therefore, all regression results were reaccomplished following the addition of June and July's observations to the data bases. A list of the summary statistics for these regressions are in Tables XII and XIII. As shown, there were few changes in the R^2 statistics; however, the F values tended to take on a different meaning. Although RET2's time variable was significant in Table XI, it was not statistically significant after the two additional observations were added. This in itself may not seem important, but if one considers the underlying patterns associated with retirement applications, one could possibly

TABLE XII

Regression Summary Statistics (Part A) Monthly Observations, Oct 79 through Jul 82				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
RET1	30074.480	.99948	.99945	1.8566
RET2	7377.640	.99790	.99777	1.5314
RET3	1708.593	.99418	.99360	1.5707
RET4	825.885	.98804	.98684	1.4790
RET5	447.647	.97815	.97956	1.9473
RET6	164.855	.94281	.93709	1.6447
RET7	76.978	.88843	.87689	2.1080
RET8	67.587	.87866	.86566	2.0579
RET9	88.720	.90481	.89462	1.7150
RET10	79.378	.89749	.88352	1.7106
RET11	74.789	.88905	.87716	1.5583
RET12	82.277	.83528	.82351	1.7753

TABLE XIII

| | | VARIABLE F STATISTICS | | | |
FILE	# OF OBS	VOL RETS	MAND RETS	POLICY VAR	TIME
RET1	34	37853.78	3210.83	N/A	N/A
RET2	34	9339.63	720.97	N/A	N/A
RET3	34	3067.55	289.46	N/A	6.08
RET4	34	1588.46	126.27	N/A	13.78
RET5	34	874.81	102.05	N/A	14.52
RET6	34	261.40	24.11	6.80	N/A
RET7	33	187.30	5.62	8.11	N/A
RET8	32	59.17	1.50	27.65	N/A
RET9	32	73.54	2.78	61.96	N/A
RET10	32	76.11	5.87	64.09	N/A
RET11	32	74.53	7.03	61.49	N/A
RET12	31	64.05	18.11	123.41	N/A

Regression Summary Statistics (Part B)
Monthly Observations, Oct 79 through Jul 82

hypothesize that the previous downward trend in retirements may be reversing or at least stabilizing. In essence, these results strengthen the previously proposed hypothesis that the downward trend in retirement application patterns may be reversing.

Model Testing

Although an analysis similar to the one used to determine an optimal number of observations for the separation analysis would have also been desirable in the retirement analysis, two things prevented its accomplishment. First, time precluded the full scale prediction error minimization which was conducted in the separation analysis. This was due to the hundreds of regression runs which would have been necessary in order to accomplish a similar analysis. Second, and most important, it was felt that due to the nature of the autocorrelation, trying to reduce the number of observations would only exacerbate the positive autocorrelation problem. Since the residual analysis of RET4 identified a pattern associated with fiscal years, a reduction of observations may result in significant undesirable equations which would reflect a particular year's application pattern and not an average trend. Therefore, the model testing phase was reduced to an analysis of prediction error magnitude, and not prediction error minimization.

In addition to the positive autocorrelation problem, small data base sizes precluded the calculations on a large scale of the prediction errors. In other words, in order to project the twelfth month of FY82, RET12 would have had only twenty observations in its data base. Therefore, the prediction error phase did not include predictions associated with observations recorded prior to October 1981. This self imposed restriction resulted in a maximum calculation of twelve prediction errors for RET1, eleven for RET2, ten for RET3, etc., until only one prediction error was calculated for RET12. Although this restriction severely limited the ability of this analysis to accurately determine the prediction errors associated with this methodology, it was felt that additional error computations would be meaningless due to data base restrictions and autocorrelation problems.

For this phase of model testing, each prediction was computed just as it would have been under operational conditions. The results of this exercise are contained in Table XIV. As shown, every data base's average prediction error was negative except RET6. Using these results, the average error for a twelve month period would be approximately 168.4. However, it should also be noted that the averages for RET7 through RET12 were heavily weighted by the large negative error associated with September 1982. Since the September errors tended to be significantly

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Table XIV

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	AUG 82	SEP 82
Retirement Regression Prediction Errors ERROR=PREDICTION-ACTUAL												
ACTUAL RETS	361	345	207	206	250	185	139	149	207	308	289	295
DATA BASE					Error							
RET1	-7	0	-3	0	-2	-2	-1	-6	-3	-2	2	2
RET2		2	1	2	6	-3	-1	-3	-8	-6	-21	-9
RET3			2	4	-1	-12	-13	-9	-18	-7	-31	-2
RET4				-16	-16	-29	-22	-15	-21	1	-15	-29
RET5					5	-18	-17	-14	-2	4	-6	-4
RET6						15	10	8	2	41	36	0
RET7							2	-10	-9	20	41	-51
RET8								14	2	-24	-8	-47
RET9									-16	-8	-22	-52
RET10										-7	-2	-71
RET11											1	-58
RET12												-57

larger than those associated with other months, the average expected error may be overstated. Therefore, in hopes of obtaining a better estimate of the model's prediction ability, an FY82 prediction was compared with actual retirements. Figure 13 displays these results.

As can be seen, the predicted retirements follow the actual retirement pattern extremely well. If it were not for the large September error, the twelve month prediction would be off only fractionally. For this exercise, the total twelve month error was computed to be sixty-three, with 90.5% of the total error occurring in the last prediction. In essence, the twelve month error of sixty-three equated to a 2.14% inaccuracy. In contrast, had the initial regressions been used to predict FY82's retirements, a 5.88% error in the prediction would have occurred. Therefore, the modifications to the data bases resulted in 63.61% improvement in the prediction error.

Conclusions

As noted, time constraints precluded the completion of a thorough analysis of retirement data. However, the results of those areas which were completed were as impressive as those associated with the separation analysis except for the positive autocorrelation problem. Also, in an examination of the prediction errors, there appears to be the possibility of a significantly larger error
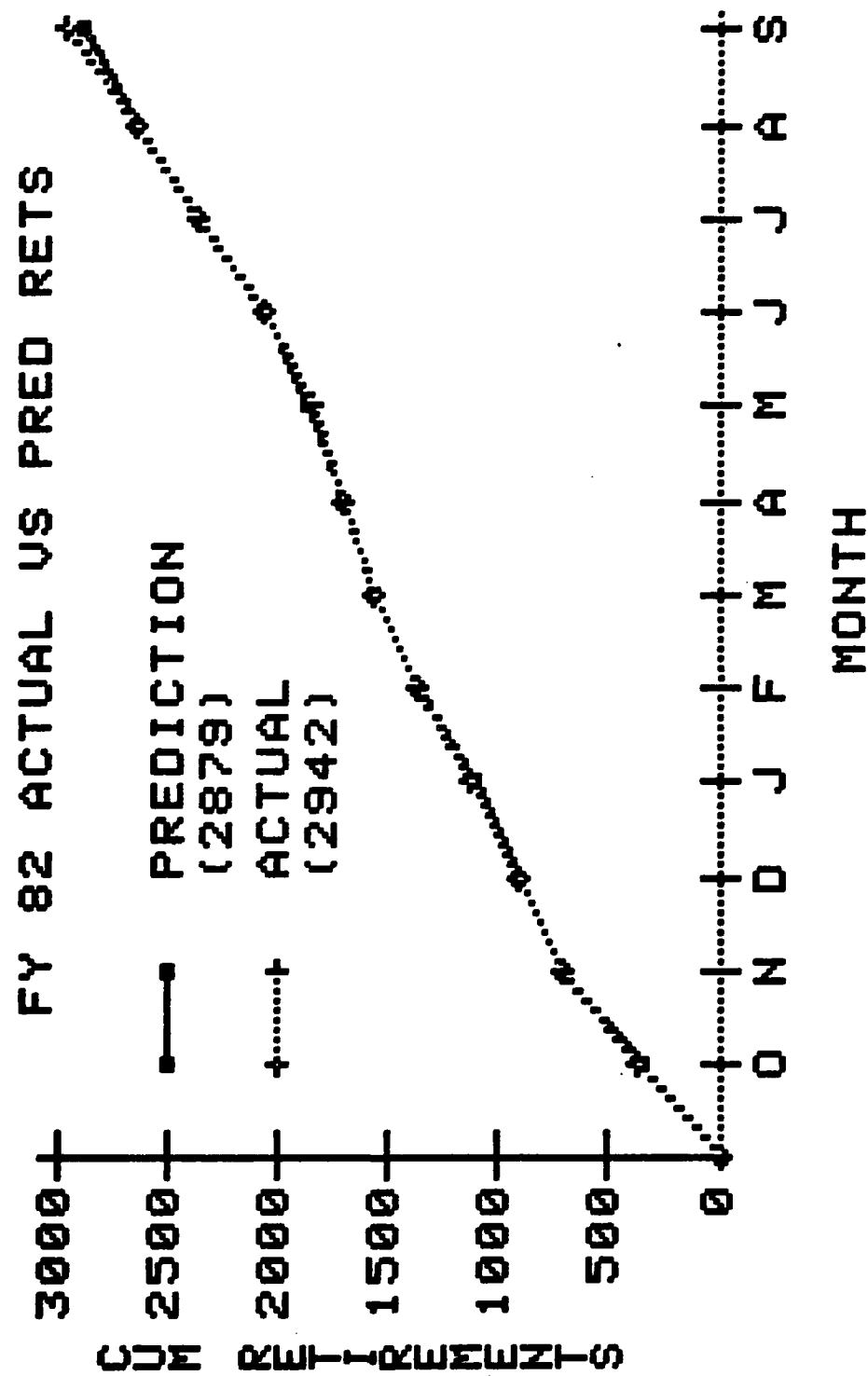
FIGURE 17. FY82 Officer Actual Rets vs Prediction

occurring than that which was computed for FY82. As can be found in Table XIV, several of the individual month's prediction errors had occurrences of large deviations from the mean. Should several of these occur within the same fiscal year's prediction, an error in the range of several hundred may not be improbable. In addition, when FY82's September prediction was made, the policy variable was not used. If there had been knowledge in October 1981 that a group of promotion failures would be required to retire on or before the month of September, an additional 197 officers would have been added to the September prediction. This addition would have changed the prediction from 2,879 to 3,076, or instead of a 2.14% error, it would have been reported as a 4.55% error. However, even this would probably be well within management tolerances for a twelve month prediction.

Recommendations

Unlike the separation prediction errors, the retirement errors do not appear to have a visible pattern. In essence, this may inhibit the ability to model the prediction errors with an ARIMA model. On the other hand, it may be that a twelve month cumulative error may be easier to model since it appears that overall, the prediction errors tend to the negative side. It may be that this tendency toward negative errors is the result of

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the decreasing retirement trend which was previously noted.

In addition to modeling the errors by means of a time series model, it was felt that a modified update procedure similar to the one proposed in the separation analysis may reduce the negative error tendency. Therefore, a trial of this procedure was accomplished. The results are displayed below in Table XV:

Table XV

Modified Update Procedure's Prediction Error FY82			
Month	Actual	Original Pred	Modified Pred
Oct	361	354	354
Nov	345	347	358
Dec	207	209	201
Jan	206	190	194
Feb	250	255	257
Mar	185	200	196
Apr	139	141	144
May	149	163	168
Jun	207	191	193
Jul	308	301	297
Aug	289	290	294
Sep	295	238	238
Total	2942	2879	2874

As shown, there is an insignificant difference between the two predictions; however, this is not to say that this procedure would not reduce the magnitude of the errors in the long run, just that it failed to provide a superior prediction in this one sample.

Finally, it is recommended that future studies include another analysis of the positive autocorrelation condition

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which existed in several of the data bases. Also, should positive identification and removal of the trends be accomplished, an analysis which would determine the optimal number of observations in each data base should be performed.

In summary, the methodology seems to have credence. However, its projections and associated prediction intervals should be appropriately caveated so as to ensure proper use.

V. Time Series Analysis of Retirement Data

Methodology and Data Base

Just as with the separation analysis, an ARIMA model was fitted to the retirement data by means of Box and Jenkins' techniques. The data used in this analysis was the ratio retirements divided by population, expressed as a percentage. The numerator of this ratio was made up of line officer retirements minus promotion failures. This was necessary since large numbers of promotion failure retirements occur approximately six months following the release of promotion board results. In other words, the temporary surge in retirements which result when promotion board results are released destroys the normal pattern of retirements which this analysis attempts to model. Also, even though non-line officer retirements were included in the regression analyses, their removal from this data base was necessary since complete historical population sizes were not available for non-line officers.

In addition to the non-line officer constraint, the number of observations for this data base was restricted to only those observations which had occurred subsequent to December 1976. This restiction was necessary for two reasons. First, population sizes for line officers were incomplete prior to January 1977. Second, even if

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population sizes were available, use of the additional data would be questionable. As mentioned in the retirement regression analysis, policy changes which occurred in the mid-1970's significantly affected retirement trends. Some of these policy changes included waivers for time-on-station and time-in-grade, as well as look-back options which benefited those officers who retired immediately following a pay increase.

Model Identification

The retirement data was analyzed as a simple time series using the same programs which were used in the separation data model identification. Using the computer output dealing with the autocorrelation plots and the periodogram values, it was determined that a significant periodicity of length twelve was inherent in the data. In essence, the analysis of the simple autocorrelation plot suggested this periodicity because of a definite sinusoidal pattern with peaks at lags twelve and twenty-four. In addition, the periodogram analysis found that a frequency of .087 (period of 11.5) was statistically significant. Based upon an average value of 1.8 and a periodogram multiplier value of 6.079, one could assume that any frequency whose intensity value was above 10.9 would be statistically significant. For this exercise, only the previously mentioned frequency of .087 was determined to be

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significant. This frequency had a calculated intensity value of 24.6.

Nonseasonal Differencing of the Data. Following the initial analysis, the data was nonseasonally differenced by order one and length twelve. This differencing was then followed by a reaccomplishment of the calculations for the autocorrelations, their respective plots, and the periodogram values. This time, the examination of the simple autocorrelation plot discovered a distinctive pattern which would be indicative of a long term wave (Figure 18). This was indicated by the gradual change from positive to negative autocorrelations as the lag increased from one to twenty-four. This hypothesis was later strengthened by the periodogram table which indicated that a statistically significant long term wave may still be in the data. For those values calculated, only the .018 frequency was statistically significant. This frequency equates to a wave of period fifty-seven. However, since the removal of such a wave by differencing would destroy the data base, the analysis continued without additional differencing. Finally, further analysis of the partial autocorrelation plot (Figure 19) indicated that the only statistically significant lag was at one. Therefore, without considering the long term wave, the plots would be indicative of an ARIMA$(1,0,0)*(0,1,0)_{12}$.

R and S Array Analysis. As noted above, the

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significant.   This   frequency   had   a calculated intensity
value of 24.6.

Nonseasonal   Differencing   of   the   Data.   Following   the
initial   analysis, the data was nonseasonally differenced by
order   one   and   length   twelve. This differencing was then
followed   by   a reaccomplishment of the calculations for the
autocorrelations,   their   respective   plots,   and   the
periodogram values.   This   time,   the   examination of the
simple   autocorrelation   plot   discovered   a   distinctive
pattern   which   would   be   indicative   of   a   long term wave
(Figure   18).   This was indicated by the gradual change from
positive   to   negative autocorrelations as the lag increased
from   one   to   twenty-four.   This   hypothesis   was   later
strengthened   by   the periodogram table which indicated that
a   statistically   significant long term wave may still be in
the   data.   For   those   values   calculated,   only the .018
frequency   was   statistically   significant.   This frequency
equates   to   a   wave   of period fifty-seven.   However, since
the   removal   of   such   a wave by differencing would destroy
the   data base,   the   analysis continued without additional
differencing.   Finally,   further   analysis   of the partial
autocorrelation   plot   (Figure   19)   indicated that the only
statistically   significant   lag   was   at   one.   Therefore,
without   considering   the long term wave, the plots would be
indicative of an ARIMA(1,0,0)*(0,1,0)$_{12}$.

R   and   S   Array   Analysis.   As   noted   above,   the

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FIGURE 18. Autocorrelation Plot of Nonseasonally Differenced
Retirement Data
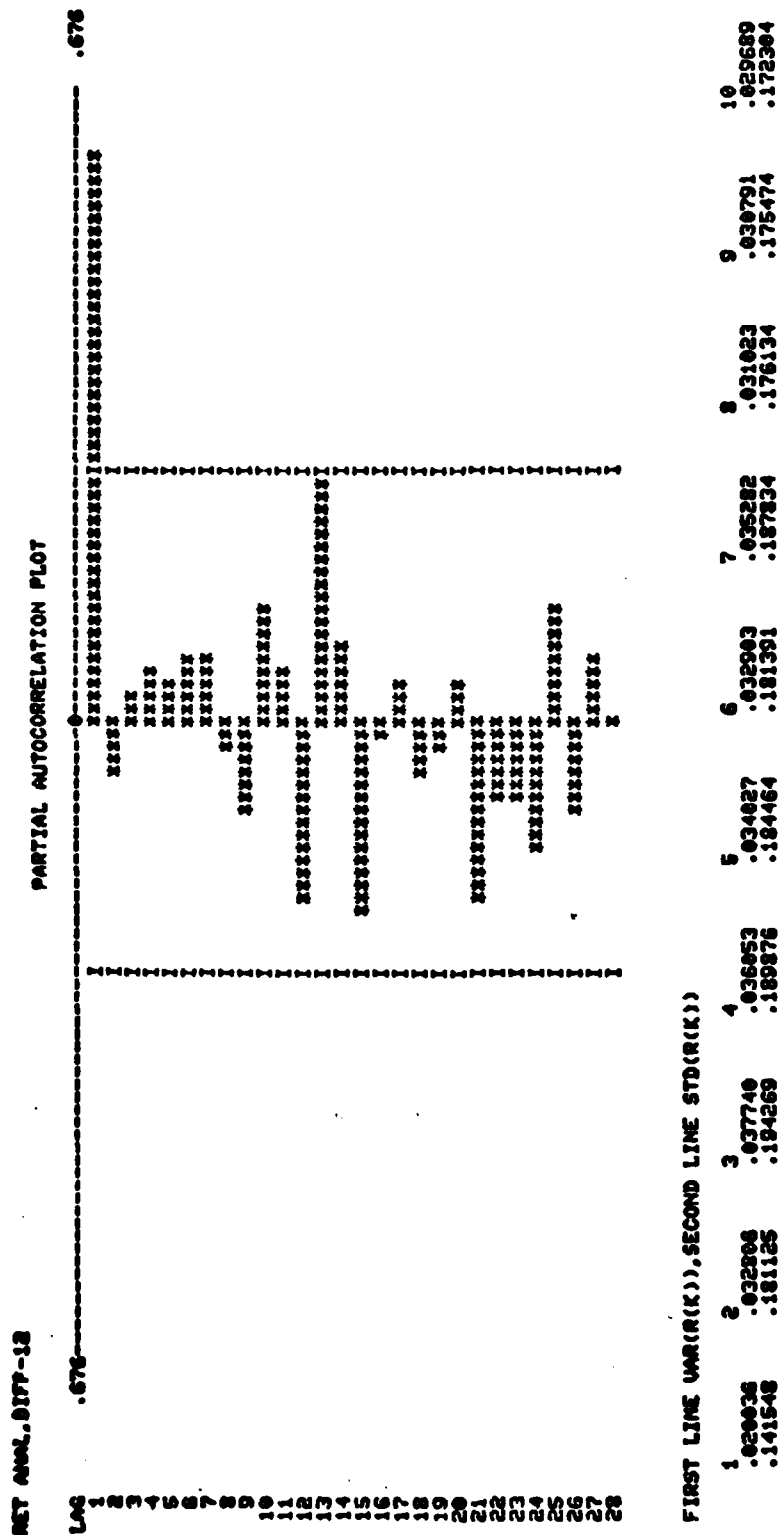
FIGURE 19. Partial Autocorrelation Plot of Nonseasonally
Difference Retirement Data

autocorrelation plots indicated that an ARIMA(1,0,0)*(0,1,0)$_{12}$ may provide an adequate fit. This model was implied because of the partial autocorrelation's significant value at lag 1. Therefore, the R and S arrays were examined for symptomatic patterns associated with this model. As hoped, the low frequency R and S arrays did substantiate the proposed model. This can be seen by examining the annotated arrays in Appendix N. Consequently, based upon the autocorrelation plots and the R and S arrays, the proposed model's coefficients were calculated so that a residual analysis could be performed. The following equation contains the maximum likelihood estimates for these coefficients:

$$(1-B^{12})(1-.6149B)Z_t = A_t$$

Multiplying out terms yields:

$$(1-.6149B-B^{12}+.6149B^{13})Z_t = A_t$$
$$Z_t = X_t - .0460$$

where X_t is the undifferenced data and .0460 is the mean of the differenced data. A complete list of all the computer generated output for the model identification phase of this analysis can be found in Appendix N.

Residual Analysis of ARIMA(1,0,0)*(0,1,0)$_{12}$. As discussed in the separation analysis, in order to accomplish the

residual analysis, many of the same steps which are used to identify an initial model are repeated in this analysis; however, intead of using the raw data, the estimated residuals which are calculated from the proposed equation are used. For this residual analysis, the computed autocorrelations failed to detect a significant lag. In essence, the residuals appeared to be white noise.

The next phase in this residual analysis was to examine the calculated Portmanteau Lack of Fit value for indications of model inadequacies. The computer generated value for this model was 17.31. Therefore, since the Chi-Square statistic for twenty-seven degrees of freedom and an alpha value of .05 was 40.11, it could not be assumed that the calculated Q value indicated model inadequacy.

Finally, a cumulative periodogram was plotted for this model (Figure 20). As shown, there does not appear to be signs of a significant periodicity not being modeled by the proposed equation. Therefore, based upon the autocorrelations, the Portmanteau value, and the cumulative periodogram plot, the proposed model does not appear to have signs of inadequacy. A complete list of the computer output for this residual analysis can be found in Appendix O.

RET ANALYSIS

ARIMA$(1, 0, 0) * (0, 1, 0)_{12}$
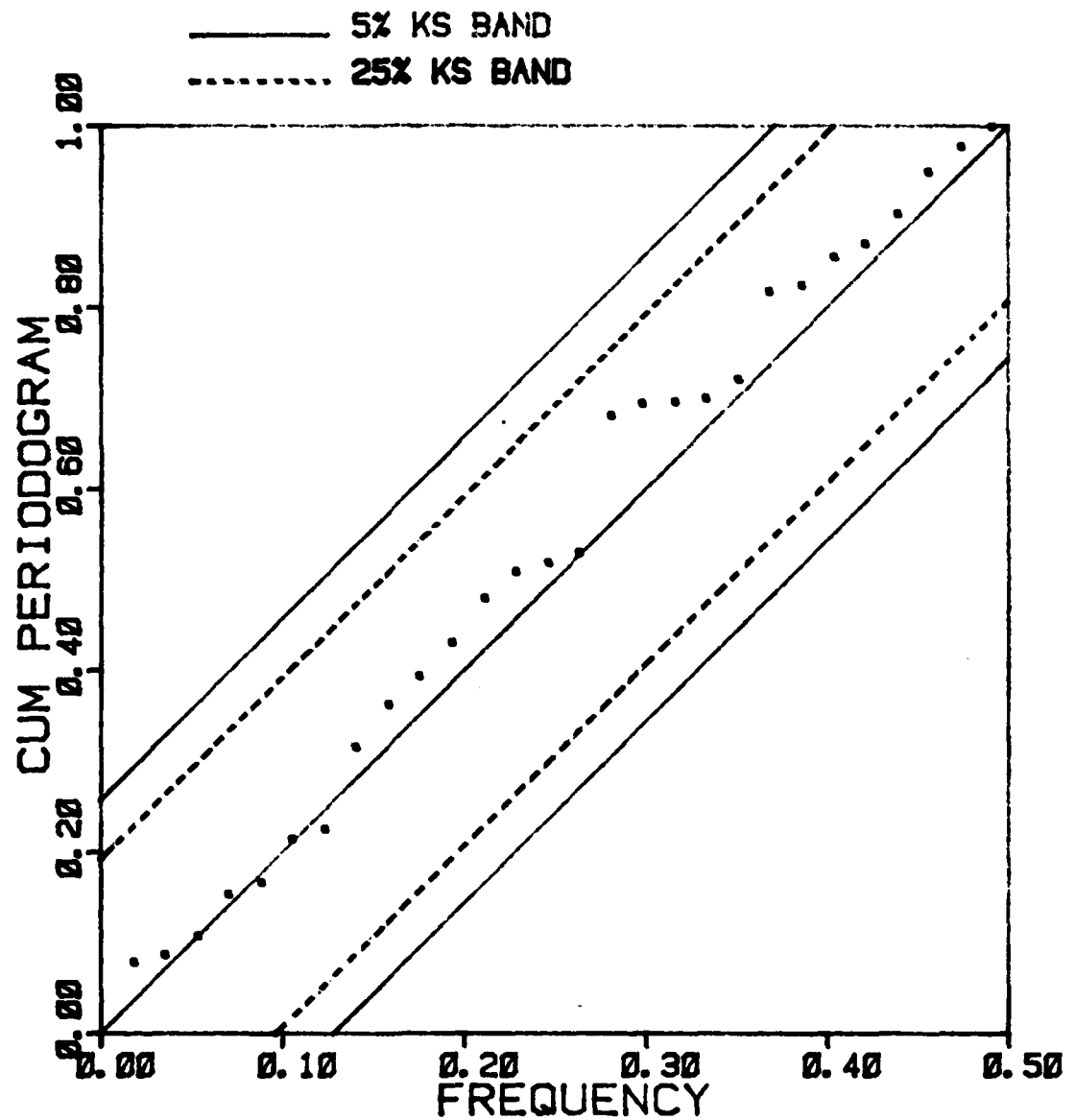
FIGURE 20.   Cumulative Periodogram for ARIMA$(1,0,0)*(0,1,0)_{12}$

Model Prediction Capability

Using data as of 30 September 1981, a prediction for FY82 was made so that a comparison could be made with actual loss rates. The following table details those results:

Table XVI

Retirement Time Series FY82 Predictions vs Actual			
Month	Actual	Pred.	% Error
Oct	3.31	0.94	-71.6
Nov	3.12	0.99	-68.3
Dec	1.85	1.00	-45.9
Jan	1.82	1.52	-16.5
Feb	1.56	1.50	- 3.8
Mar	1.62	1.15	-29.0
Apr	1.26	1.66	+31.7
May	1.31	1.47	+12.2
Jun	1.79	1.83	+ 2.2
Jul	2.68	2.76	+ 3.0
Aug	2.53	3.00	+18.6
Sep	2.01	1.89	- 6.0
Total	24.86	19.71	-20.7

The twelve month rate difference of 5.15 (24.86-19.71) equates to an underprediction of more than 550 retirements. Considering that 2,716 line officer retirements occurred in FY82, this prediction equates to an error of more than 20%. Therefore, since it would be unlikely that such an underestimate would be considered tolerable by management, additional analysis should be conducted in an attempt to reduce this error.

Conclusions

Although it appeared that an adequate model was identified, attempts to predict retirements with the proposed model proved discouraging. It would appear that the previously discussed policy, pay, and promotion board timing changes injected a degree of randomness into the data which the model was unable to capture. However, this would not be counterintuitive since management itself cannot accurately predict pay raises, policy changes, and dates for which promotion boards are to be held. Consequently, attempts to model retirement trends by use of a simple time series process will, in all probability, continue to fall short of the desired goals. In other words, it seems apparent that a process of higher complexity is needed before acceptable errors in the predictions are achieved. A brief discussion is presented below in the recommendataions section.

Recommendations

Because of the detected long term periodicity in the data, future attempts to model retirement data should contain an analysis which would remove and project those trends from the data. This could possibly be conducted by the same procedure which was discussed in the separation analysis. However, even with an analysis of long term trends, short term changes in policies can destroy those

long term waves, e.g., a pay raise which is significantly larger than the observed increases in the consumer price index will drastically change retirement patterns. Historically, large numbers of individuals have delayed their retirement until sometime after large pay increases have become effective. This delay will in most cases result in larger retirement compensation for those individuals who chose to delay their retirement. Consequently, the focus of future analysis should be on the identification of a transfer function model, i.e., one which could be used to predict the degree of change which policy modifications inflict.

VI. Review, Conclusions, and Recommendations

This chapter will discuss the results of the four previous chapters and compare the predictive capabilities of the proposed models with the AFCOPS model.

Review of Accomplishments

During the course of this research, numerous models were examined as well as modifications to those models. Below is a list of the explored models along with a brief discussion of their nature:

   (1) A regression model of separation application patterns. This model used accomplished line, JAG, and chaplain separations as the dependent variable, and DOSs without an SPD and DOSs with an SPD as the independent variables. Because of the consistent overprediction of this model, attempts were made to identify and remedy this problem. This process included both a residual analysis and a modified update procedure of the methodology. A test of the modified update procedure resulted in a 43.2% improvement in the regression methodology's FY82 prediction.

   (2) A time series analysis of line officer separation rates. This model, which used Box and Jenkins' techniques, analyzed separation rates as a simple time series. Several ARIMA models were identified, with the final process chosen being an $ARIMA(2,1,0)*(1,1,0)_{12}$.

   (3) A regression analysis of retirement application trends. Retirement application trends were analyzed by regressing accomplished line, JAG, and chaplain

retirements into approved and in-system
voluntary and mandatory retirements. Because
of positive autocorrelation problems in some
of the files, one of the data bases was
selected for a comprehensive residual
analysis in an attempt to identify the cause
for the autocorrelation.

(4) A time series analysis of line officer
retirement trends. A ratio of line officer
retirements divided by the population and
expressed as a percentage was analyzed as a
simple time series. Several models were
identified, with the final model chosen being
an ARIMA$(1,0,0)*(0,1,0)_{12}$.

Conclusions

This section will present those conclusions which are
most significant. First, the conclusions associated with
the time series methodology will be examined. This is then
followed by the conclusions associated with the regression
analyses. Following each subheading, a brief expanded
discussion of the major conclusions is made.

Time Series Approach. Chapter III of this thesis dealt
with a time series analysis of line officer separation
trends. The following list summarizes the conclusions
reached in that analysis:

(1) An ARIMA$(2,1,0)*(1,1,0)_{12}$ was determined to
provide the best fit of the data. However,
other models also provided an adequate fit.

(2) Short term (monthly) projection accuracies
were unacceptable. However, an FY82 (12
month) projection was within 63 (5.5%) of the
actual separations for that year.

(3) A long term periodicity, which is observable
in the data, could not be captured in the

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time series model. This resulted in negative
loss rate predictions for FY84 when data as
of September 1981 was used.

The other time series analysis which was accomplished in
this thesis attempted to model line officer retirement
trends (Chapter V). The following list summarizes the
conclusions reached in that analysis:

(1) An ARIMA$(1,0,0)*(0,1,0)_{12}$ model was determined
to provide an adequate fit.

(2) Monthly prediction errors were deemed
unacceptable. Errors in excess of 50% were
observed when monthly FY82 retirements were
predicted.

(3) Long term predictions were also found to be
unacceptable. The FY82 prediction was in
error by more than 500 (20.7%) retirements.

(4) The model presented could not account for
changes in retirements caused by promotion
board results, pay increases, or policy
changes.

Discussion. Although time series models would have
the ability to project losses beyond twelve months, which
is the maximum time frame attributable to the regression
models in this thesis, there are obvious pitfalls inherent
in their use. First of all, those models which were
identified in this research failed to capture long term
trends. This failure resulted in perceptible patterns
which when extended into future fiscal years resulted in
negative loss rate projections. Secondly, even though the
separation model's FY82 prediction was within management's

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tolerable limits, its failure to accurately predict monthly separation rates (see Table VII) made the model unusable except as a tool for the comparison of yearly loss projections. In other words, since the model's predictions for individual months would be expected to deviate significantly from the actual observed values, it would be extremely difficult to ascertain if (1) the model's short term estimates were in error but the long term trend was still valid, or if (2) the long term trend had changed and this change was the cause for the short term errors. Finally, since those models which were presented in these analyses do not use leading indicators, changes to predictions which would result from changes in promotion boards, pay benefits, and policy modifications could not be captured in the proposed model's estimates. Therefore, this drawback significantly limited the model's ability to predict retirements.

In summary, the time series approach as proposed in this research has obvious flaws which limit its use. However, this is not to say that variations in the models, the availability of additional data at some future date, or the introduction of leading indicators could not overcome many of the blemishes annotated within this research.

Regression Approach. Regression analyses of both separation (Chapter II) and retirement (Chapter IV) application trends were also made. The following list

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details the results of those analyses:

(1) Projections produced by this methodology were
extremely accurate. An FY81 separation
prediction was in error by only 1.8%, the
FY82 separation prediction was in error by
16.9%, and the FY82 retirement estimate
missed the actual retirement number by 2.1%.

(2) For the separation analysis, using a data
base comprised of the most recent twenty-four
observations was found to provide a better
model, as compared to models produced by
using a larger number or smaller number of
observations. Both the MSE and the R^2 were
optimized for approximately twenty-four
observations. This better fit would result
in tighter prediction intervals produced by
these models.

(3) Although twenty-four observations in each
data base was optimal, as the number of
observations decreased, the mean of the
prediction error tended to decrease, but the
standard deviation remained nearly constant.

(4) Updating data bases with projections produced
by other data bases significantly improved
the FY82 separation prediction, reducing the
error to 9.6%.

(5) Several of the retirement data bases were
found to be autocorrelated. This was
believed to be caused by retirement trends
within fiscal years.

Discussion. Of the two approaches examined,
regression analysis appears to be the most promising. In
fact, in the aggregate, the predictions made were extremely
accurate. When the regression predictions are compared to
the previously used AFCOPS predictions (Ref 4), the
improvements are obvious. Table XVII compares each
methodology's estimates.

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Table XVII

AFCOPS Predictions vs Regression Predictions						
	FY81		FY82			
Methodology	Seps	Error	Seps	Error	Rets	Error
AFCOPS*	2105	+24.9%	2123	+79.0%	3155	+ 7.2%
AFCOPS**	1961	+16.3%	1737	+46.5%	2891	- 1.7%
Regression	1717	+ 1.8%	1386	+16.9%	2879	- 2.1%
Actual	1686		1186		2942	

* Prediction based upon two years of historical
   loss information

** Prediction based upon one year of historical
    loss information

As noted above, two different AFCOPS estimates were prepared for each fiscal year's prediction. This was due to the changing loss patterns which were occurring during the preceeding few years. Therefore, by using only one year of loss information, it was hoped that a better estimate of losses could be obtained. However, as can be seen in the table, with the exception of the AFCOPS FY82 retirement estimate using only one year of historical loss information, the regression estimates were significantly better.

In summary, use of the regression methodology provides significant improvements in the predictions of voluntary separations and retirements when compared to the currently used AFCOPS model. Also, since the independent variables used in this methodology act as a barometer of future losses, these models have the ability to alter their

estimates as economic and policy conditions affect the propensity of Air Force officers to depart active duty. In addition, because of the simplistic nature of this methodology, monthly estimates can be produced so that long term trends in the predictive capability of the models can be analyzed. This ability, which is not economically feasible with the AFCOPS model because of the extensive computer and personnel costs involved with its maintenance and production, gives an added dimension to the regression models.

Recommendations

As elaborated on above, the regression models explored in this thesis are superior to the AFCOPS model in predicting officer voluntary separations and retirements. Therefore, it is recommended that the regression methodology be adopted for use as a predictive tool within the personnel management community.

Each chapter of this thesis details areas which this author considers needing additional research. In summary, it is felt that for time series models to be of significant benefit in predicting loss trends:

(1) Additional data is required

(2) An index of leading indicators must be
    identified which would link pay, promotions,
    and policy changes to losses.

(3) A Fourier analysis of long term trends must
be accomplished so that significant long term
patterns can be removed from the time series
prior to the accomplishment of a time series
analysis.

Although   the   regression   models   provided   significantly

improved   predictions when compared to the AFCOPS model, the

following areas should be further explored:

(1) A comprehensive analysis of the residual
patterns in order to identify further
improvements in the model. This could be
accomplished by time series analysis,
weighting the observations, or exploring
alternative update procedures.

(2) Additional analysis of the residual patterns
associated with the retirement data. Several
data bases either hinted at or had positive
autocorrelation. Although this research
identified a possible cause for the residual
pattern, additional research needs to be
accomplished which would identify and capture
the pattern.

(3) Accomplish a full scale analysis of the
modified update procedure which was
identified in the separation analysis
(Chapter II).

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APPENDIX A

FYCOPS Report

PREPARED: 02 OCT 1982   SUMMARY OF TYPE ACCOMPLISHED ACTIONS FOR OCTOBER 1981 -- SEPTEMBER 1982   EFFECTIVE: 30 SEP 1982

<< ADDITIONAL LOSS DETAIL - NORMAL LOSSES >>

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD
NORMAL LOSS TOTALS	591	536	406	393	419	363	320	316	417	753	579	537	5630
LINE TOTALS	400	440	392	312	349	277	247	238	345	430	452	428	4351
ATTRITION	27	14	29	23	21	24	32	27	19	28	36	25	301
DEATH	7	7	8	10	4	6	18	7	4	6	2	10	93
VOLUNTARY	5		1	2		2	1	2			2	2	16
NAF UNKNOWN		1	4	6	5	2		2	3	3	4	3	30
OTHER	14		16	5	12	12	11	13	12	10	24	10	152
SEPARATIONS	93	61	100	63	60	73	75	71	129	111	137	113	1166
END OBLIGATION	48	40	42	41	33	16	35	24	64	51	59	39	494
ACADEMY	6			3			3	2	14	20	12	5	72
ROTC	38	23	23	36	10	11	19	16	41	29	31	26	312
OTS		1	1				2		2			1	8
AFCP													
OTHER	3	12	16	2	11	6	11	6	7	2	16	7	102
CAREER SEPARATION	48	56	56	41	46	48	35	43	59	59	76	57	624
INVOLUNTARY SEPARATION				1	1								
PROBATION FAILURE	2		2	1		7	5	4	6	1	2	17	47
RETIREMENTS	353	385	203	206	240	166	140	144	201	299	279	290	2084
DISABILITY	14	7	12		157	10		9	5	6		10	103
VOLUNTARY	326	371	160	160	157	160	124	124	180	274	249	193	2460
MANDATORY	14		9	11	10	6	7	11	12	15	21	18	145
PROBATION FAILURE			2	6	76	2	7	4	4	4	1	69	160
NON-LINE TOTALS	111	87	74	61	70	86	73	70	68	315	127	109	1279
NON-MEDICAL TOTALS	9	14	11	9	9	10	7	12	12	13	10	15	137
JAG TOTALS	6	3	9	7	6	9	5	9	6	5	10	10	93
ATTRITION							1						2
SEPARATIONS	2	6	7	6	5	5	4	6	7	4	6	8	66
END OBLIGATION	2	6	5	5	2	2	1	4	4	3	5	4	43
CAREER			2		3	3	3	2	3		1	4	23
INVOLUNTARY													
PROBATION FAILURE				1	1	4		3	1	1	4	2	25
RETIREMENTS	1	3	2										
CHAPLAIN TOTALS	3		2	1	2	1	2	3	4	6	8	5	44
ATTRITION				1				2				1	2
SEPARATIONS					2						2		9
END OBLIGATION								1				1	5
CAREER													3
INVOLUNTARY							1			1			
PROBATION FAILURE													
RETIREMENTS	3	3	2		2		2		4	7	6	3	33

PCN: RSH5052003

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END OF MONTH

PREPARED: 02 OCT 1982   SUMMARY OF FY82 ACCOMPLISHED ACTIONS FOR OCTOBER 1981 -- SEPTEMBER 1982   EFFECTIVE: 30 SEP 1982

<< FORCE REDUCTION PROGRAMS - EARLY RELEASE >>

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD
LINE TOTALS	30	19	18	14	11	17	9	23	21	25	21	26	234
CARRYOVERS	14												14
RETIREMENT WAIVERS													
POLICY 1													
PILOT													
NAVIGATOR													
NON-RATED													
PALACE CHASE			2			4			1	2		5	15
PALACE FRONT DOOR													
PILOT													
NAVIGATOR													
7 DAY OPTION	16	12	15	14	11	13	7	21	19	22	16	20	195
POLICY 2													
PILOT													
NAVIGATOR													
NON-RATED			1				2	1		1	3	1	10
OTHER													
NON-LINE TOTALS	5	2	3	3	3	3	2	7	1	15	0	4	56
MEDICAL													
MEDICAL CORPS													
DENTAL CORPS													
NURSE													
VETERINARY													
MEDICAL SERVICES													
BIOMEDICAL													
JAG													
CARRYOVERS	3	1										4	4
RETIREMENT WAIVERS													
7 DAY OPTION													
OTHER	2	1	3	3	3	3	2	7		15	0	4	52
EARLY RELEASE TOTAL	33	21	21	17	14	20	11	30	22	40	29	30	290

END OF MONTH

PCN:RSH5053200S

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PREPARED: 02 OCT 1982 SUMMARY OF FY82 ACCOMPLISHED ACTIONS FOR OCTOBER 1981 -- SEPTEMBER 1982 EFFECTIVE: 30 SEP 1982

< < FORCE REDUCTION PROGRAMS - INVOLUNTARY RELEASE > >

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD
LINE TOTALS													
FLIGHT TNG ELIMINEES	13	27	23	18	30	25	37	42	57	39	46	69	426
TECH TNG ELIMINEES	10	17	15	10	20	15	25	33	30	36	42	65	327
ONE PASSOVER TEMP-04	3	7	8	7	9	10	11	9	15	2	3	14	88
DOS ROLLBACK		3		1	1		1		3	1	1		11
PILOT 1 YR													
NAVIGATOR 1 YR													
SUPPORT 1 YR													
PILOT 2 YR													
NAVIGATOR 2 YR													
SUPPORT 2 YR													
RIF													
NON-LINE TOTALS													
ONE PASSOVER TEMP 04											1		1
RIF													
OTHER													
INVOLUNTARY RELEASE TOTAL	13	27	23	18	30	25	37	42	57	39	47	69	427
EARLY RELEASE TOTAL	35	21	21	17	14	20	11	30	22	40	29	30	290
SPECIAL PROGRAMS TOTAL	48	48	44	35	44	45	48	72	79	79	76	99	717

END OF MONTH

PREPARED: 02 OCT 1982   SUMMARY OF FY00 PROJECTED ACTIONS FOR OCTOBER 1982 - SEPTEMBER 1983   EFFECTIVE: 30 SEP 1982

<< ADDITIONAL LOSS DETAIL - NORMAL LOSSES >>

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
NORMAL LOSS TOTALS	579	343	265	269	140	442	82	75	84	132	89	53	2573
LINE TOTALS	490	300	255	208	111	390	73	67	75	105	74	39	2199
ATTRITION													
DEATH	3												5
VOLUNTARY													
WAF UNIQUE			1										2
OTHER	2											2	2
SEPARATIONS	70	43	39	41	25	311	6	10	8	6	2	1	562
END OBLIGATION	15	13	10	9	10	5	1	3	5				71
ACADEMY	4	5	2			2			4				18
ROTC	7	4	6	6	7	3							30
OTS													
AECP													
OTHER	1	1		3	3							1	16
CAREER SEPARATION	47	27	27	29	15	13	5	7	3	6	2	1	162
INVOLUNTARY SEPARATION													
PROMOTION FAILURE	0	3	2	3		(290)	67	57					309
RETIREMENTS	421	251	215	167	86	97	67	57	67	99	72	38	1632
DISABILITY	6												6
VOLUNTARY	377	220	194	154	73	72	54	35	54	72	42	15	1362
MANDATORY	33	21	16	11	13	15	13	22	13	27	30	23	237
PROMOTION FAILURE	7	13	5	2									27
NON-LINE TOTALS	83	45	30	61	29	44	9	0	9	27	15	14	374
NON-MEDICAL TOTALS	13	10	0	24	3	12	3	3	6	12	9	9	112
JAG TOTALS	11	6	6	21	1	10	3	3	6	11	8	9	95
ATTRITION													
SEPARATIONS	3	3	3	18		9	2	2	5	10	7	2	73
END OBLIGATION	3	3	3	10	1	6	2	1	3	9	7	8	63
CAREER									2			1	6
VOLUNTARY													
PROMOTION FAILURE						4							4
RETIREMENTS	0	3	3	3		1	1	1	1	1	1		22
CHAPLAIN TOTALS	2	1	2	3	2	2							17
ATTRITION													
SEPARATIONS													
END OBLIGATION													
CAREER													
INVOLUNTARY													
PROMOTION FAILURE													
RETIREMENTS	2	4	2	3	2	1					1		16

PCN: RSH5052005

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END OF MONTH

PREPARED: 02 OCT 1982   SUMMARY OF FY82 PROJECTED ACTIONS FOR OCTOBER 1982 - SEPTEMBER 1983   EFFECTIVE: 30 SEP 1982

< < FORCE REDUCTION PROGRAMS - EARLY RELEASE > >

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
LINE TOTALS													
FY81 CARRYOVERS	9	16	14	4	11	3	5	.	4	3	1	2	72
RETIREMENT WAIVERS													
POLICY 1													
PILOT	.	.	.	.	.	.	.	.	.	.	.	.	1
NAVIGATOR													
NON-RATED													
PALACE CHASE	.	.	1	.	.	.	.	.	.	.	.	.	1
PALACE FURLOUGH													
PILOT													
NAVIGATOR													
7 DAY OPTION	0	16	12	4	11	2	6	.	4	3	1	2	69
POLICY 2													
PILOT													
NAVIGATOR													
NON-RATED													
OTHER	.	.	.	.	.	1	.	.	.	.	.	.	1
NON-LINE TOTALS	2	1	1	3	1	.	.	.	.	.	.	.	6
MEDICAL													
MEDICAL CORPS													
DENTAL CORPS													
NURSE													
VETERINARY													
MEDICAL SERVICES													
BIOMEDICAL													
JAG													
CARRYOVERS													
RETIREMENT WAIVERS													
7 DAY OPTION													
OTHER	2	.	.	.	.	.	.	.	.	.	.	.	8
EARLY RELEASE TOTAL	11	17	15	7	12	3	5	.	4	3	1	2	80

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END OF MONTH

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PREPARED: 02 OCT 1982   SUMMARY OF THE PROJECTED ACTIONS FOR OCTOBER 1982 - SEPTEMBER 1983   EFFECTIVE: 30 SEP 1982

FORCE REDUCTION PROGRAMS - INVOLUNTARY RELEASE >>

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
LINE TOTALS													
FLIGHT TNG ELIMINEES	1	2											9
TECH TNG ELIMINEES													
ONE PASSOVER TEMP-O4	1	2											3
DOS ROLLBACK													
PILOT 1 YR													
NAVIGATOR 1 YR													
SUPPORT 1 YR													
PILOT 2 YR													
NAVIGATOR 2 YR													
SUPPORT 2 YR													
RIF													
NON-LINE TOTALS													
ONE PASSOVER TEMP-O-1													
RIF													
OTHER													
INVOLUNTARY RELEASE TOTAL / EARLY RELEASE TOTAL	11	17	15	7	12	3	5		4	3	1	2	80
SPECIAL PROGRAMS TOTAL	12	19	15	7	12	3	5		4	3	1	2	83

PREPARED: 02 OCT 1982

PROJECTED FY03 U 0 S W/0 S P D

EFFECTIVE: 30 SEPT 1982

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
LINE	71	56	47	161	198	165	155	309	345	363	630	811	3319
JAG	4	.	.	7	.	1	.	3	6	2	3	8	33
CHAPLAIN	2	1	.	1	1	.	1	4	.	5	7	4	26
MEDICAL	15	7	2	12	2	5	3	1	1	198	37	33	316
DENTAL	1	1	2	2	1	.	2	2	11	56	33	24	142
NURSE	7	14	7	25	27	38	3	27	9	86	59	46	340
VETERINERY													
MEDICAL SERVICES	.	.	.	8	3	1	1	4	2	40	4	4	67
BIOMEDICAL	2	2	2	9	4	10	1	22	3	45	12	13	125
UNKNOWN	.	.	.	.	.	.	.	.	.	.			
TOTAL	102	91	60	225	236	220	166	379	376	795	793	943	4376

END-OF-MONTH

PCN:RSH5052005

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APPENDIX B

Listings of the Separation Data Bases

used in the Regression Analysis

SEP1

CASE-NO	ACCOMP	NOSPD	SPD
1	290.	15.	278.
2	340.	13.	334.
3	274.	90.	243.
4	270.	86.	238.
5	262.	57.	232.
6	208.	47.	194.
7	149.	13.	149.
8	206.	40.	178.
9	170.	41.	158.
10	152.	22.	139.
11	160.	19.	160.
12	164.	28.	143.
13	147.	11.	143.
14	156.	25.	143.
15	256.	77.	235.
16	212.	53.	191.
17	168.	49.	148.
18	186.	84.	152.
19	125.	36.	117.
20	148.	42.	125.
21	119.	42.	104.
22	108.	57.	86.
23	114.	47.	88.
24	93.	26.	86.
25	119.	25.	105.
26	128.	49.	101.
27	191.	74.	144.
28	178.	54.	159.
29	154.	49.	128.
30	94.	53.	74.
31	99.	43.	77.
32	101.	46.	77.
33	91.	58.	66.
34	84.	62.	66.
35	73.	29.	67.
36	76.	35.	46.
37	74.	35.	59.

SEP2

CASE-NO	ACCOMP	NOSPD	SPD
1	340.	14.	333.
2	274.	117.	250.
3	270.	134.	222.
4	262.	70.	231.
5	238.	53.	191.
6	149.	12.	154.
7	206.	50.	156.
8	170.	46.	163.
9	152.	20.	151.
10	160.	25.	166.
11	164.	33.	141.
12	147.	11.	153.
13	156.	25.	154.
14	256.	86.	251.
15	212.	52.	192.
16	168.	66.	155.
17	186.	95.	153.
18	125.	44.	119.
19	148.	46.	126.
20	119.	62.	102.
21	108.	77.	85.
22	114.	75.	92.
23	93.	26.	85.
24	119.	34.	103.
25	128.	54.	107.
26	191.	102.	142.
27	178.	72.	150.
28	154.	52.	129.
29	94.	70.	77.
30	99.	47.	81.
31	101.	49.	86.
32	91.	61.	72.
33	84.	68.	71.
34	73.	29.	70.
35	76.	46.	47.
36	74.	49.	63.

SEP3

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	146.	234.
2	270.	141.	210.
3	262.	88.	226.
4	208.	67.	187.
5	149.	16.	153.
6	206.	54.	177.
7	170.	51.	158.
8	152.	20.	149.
9	160.	39.	156.
10	164.	47.	133.
11	147.	16.	143.
12	156.	31.	150.
13	256.	98.	238.
14	212.	63.	191.
15	168.	98.	154.
16	186.	123.	150.
17	125.	47.	109.
18	148.	59.	122.
19	119.	69.	93.
20	108.	78.	81.
21	114.	73.	89.
22	93.	32.	82.
23	119.	35.	101.
24	128.	76.	104.
25	191.	110.	138.
26	178.	97.	145.
27	154.	70.	106.
28	94.	98.	73.
29	99.	49.	79.
30	101.	49.	81.
31	91.	76.	70.
32	84.	88.	66.
33	73.	24.	69.
34	76.	85.	45.
35	74.	68.	60.

SEP4

CASE-NO	ACCOMP	NOSPD	SPD
1	270.	157.	195.
2	262.	97.	223.
3	208.	101.	180.
4	149.	23.	144.
5	206.	59.	167.
6	170.	53.	158.
7	152.	23.	146.
8	160.	45.	157.
9	164.	61.	128.
10	147.	20.	141.
11	156.	32.	147.
12	256.	113.	229.
13	212.	75.	187.
14	168.	111.	154.
15	186.	168.	145.
16	125.	61.	104.
17	148.	72.	111.
18	119.	84.	88.
19	108.	87.	79.
20	114.	83.	85.
21	93.	35.	79.
22	119.	64.	100.
23	128.	96.	101.
24	191.	134.	141.
25	178.	113.	145.
26	154.	105.	96.
27	94.	132.	73.
28	99.	72.	75.
29	101.	66.	79.
30	91.	93.	65.
31	84.	86.	69.
32	73.	30.	60.
33	76.	98.	39.
34	74.	98.	58.

SEP5

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	108.	209.
2	238.	112.	165.
3	149.	37.	140.
4	206.	85.	153.
5	170.	59.	144.
6	152.	26.	134.
7	160.	51.	149.
8	164.	66.	122.
9	147.	25.	130.
10	156.	37.	139.
11	256.	134.	213.
12	212.	85.	167.
13	168.	127.	143.
14	166.	180.	132.
15	125.	82.	93.
16	148.	89.	104.
17	119.	97.	80.
18	103.	136.	74.
19	114.	97.	81.
20	93.	39.	74.
21	119.	73.	88.
22	128.	146.	94.
23	191.	152.	129.
24	178.	146.	136.
25	154.	115.	83.
26	94.	184.	69.
27	99.	112.	65.
28	101.	77.	73.
29	91.	105.	61.
30	84.	94.	67.
31	73.	37.	54.
32	76.	129.	37.
33	74.	113.	51.

SEP6

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	122.	155.
2	208.	133.	125.
3	149.	42.	101.
4	206.	123.	105.
5	170.	70.	97.
6	152.	33.	93.
7	160.	52.	96.
8	164.	70.	88.
9	147.	34.	99.
10	156.	47.	102.
11	256.	155.	156.
12	212.	101.	121.
13	168.	152.	89.
14	186.	207.	111.
15	125.	89.	64.
16	148.	123.	68.
17	119.	123.	54.
18	128.	126.	49.
19	114.	109.	48.
20	93.	41.	53.
21	119.	80.	52.
22	128.	169.	67.
23	191.	183.	89.
24	178.	164.	79.
25	154.	139.	61.
26	94.	215.	35.
27	99.	166.	48.
28	101.	130.	30.
29	91.	112.	39.
30	84.	101.	40.
31	73.	46.	37.
32	76.	130.	27.
33	74.	128.	28.

SEP7

CASE-NO	ACCOMP	NOSPD	SPD
1	208.	158.	80.
2	149.	49.	51.
3	206.	132.	72.
4	170.	85.	68.
5	152.	39.	68.
6	160.	54.	63.
7	164.	75.	53.
8	147.	36.	62.
9	156.	55.	63.
10	256.	193.	83.
11	212.	119.	60.
12	168.	162.	46.
13	186.	229.	58.
14	125.	99.	43.
15	148.	145.	37.
16	119.	142.	28.
17	108.	139.	28.
18	114.	124.	23.
19	93.	46.	24.
20	119.	92.	34.
21	128.	191.	41.
22	191.	197.	48.
23	178.	179.	41.
24	154.	161.	35.
25	94.	251.	17.
26	99.	186.	22.
27	101.	153.	14.
28	91.	135.	19.
29	84.	109.	18.
30	73.	53.	11.
31	76.	145.	18.
32	74.	154.	17.

SEP8

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	56.	41.
2	206.	148.	60.
3	170.	94.	55.
4	152.	62.	54.
5	160.	58.	45.
6	164.	77.	46.
7	147.	37.	50.
8	156.	60.	56.
9	256.	220.	61.
10	212.	145.	49.
11	168.	192.	40.
12	186.	235.	40.
13	125.	113.	29.
14	148.	172.	27.
15	119.	158.	19.
16	108.	174.	16.
17	114.	145.	17.
18	93.	54.	21.
19	119.	185.	25.
20	128.	209.	34.
21	191.	208.	32.
22	178.	190.	33.
23	154.	178.	26.
24	94.	283.	18.
25	99.	221.	17.
26	101.	173.	7.
27	91.	152.	14.
28	84.	131.	14.
29	73.	60.	9.
30	76.	159.	12.
31	74.	165.	11.

SEP9

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	254.	56.
2	270.	223.	68.
3	262.	151.	54.
4	208.	175.	46.
5	149.	63.	38.
6	206.	163.	55.
7	170.	111.	44.
8	152.	65.	48.
9	160.	73.	38.
10	164.	85.	35.
11	147.	39.	43.
12	156.	61.	40.
13	255.	240.	51.
14	212.	152.	37.
15	168.	236.	24.
16	186.	255.	29.
17	125.	120.	23.
18	148.	187.	21.
19	119.	173.	18.
20	108.	194.	15.
21	114.	174.	13.
22	93.	59.	17.
23	119.	111.	21.
24	128.	225.	22.
25	191.	220.	29.
26	178.	207.	25.
27	154.	192.	17.
28	94.	311.	7.
29	99.	245.	13.
30	101.	196.	7.
31	91.	159.	10.
32	84.	153.	12.
33	73.	71.	7.
34	76.	164.	11.
35	74.	170.	9.

SEP10

CASE-NO	ACCOMP	NOSPD	SPD
1	270.	235.	61.
2	262.	153.	47.
3	208.	187.	34.
4	149.	67.	35.
5	206.	171.	48.
6	170.	124.	34.
7	152.	77.	35.
8	160.	81.	37.
9	164.	101.	30.
10	147.	51.	37.
11	156.	66.	30.
12	256.	256.	39.
13	212.	168.	36.
14	168.	255.	20.
15	185.	280.	23.
16	125.	124.	15.
17	148.	196.	17.
18	119.	188.	13.
19	108.	213.	11.
20	114.	196.	8.
21	93.	73.	13.
22	119.	118.	17.
23	128.	249.	15.
24	191.	233.	22.
25	178.	219.	19.
26	154.	201.	11.
27	94.	326.	5.
28	99.	267.	6.
29	101.	215.	5.
30	91.	176.	9.
31	84.	164.	8.
32	73.	81.	6.
33	76.	177.	7.
34	74.	183.	6.

SEP11

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	167.	49.
2	208.	199.	29.
3	149.	75.	30.
4	206.	187.	37.
5	170.	128.	25.
6	152.	84.	30.
7	160.	88.	35.
8	164.	109.	23.
9	147.	69.	35.
10	156.	83.	23.
11	256.	267.	34.
12	212.	171.	29.
13	168.	275.	19.
14	186.	296.	22.
15	125.	154.	13.
16	148.	210.	13.
17	119.	192.	10.
18	108.	233.	8.
19	114.	210.	8.
20	93.	76.	10.
21	119.	145.	14.
22	128.	262.	8.
23	191.	243.	13.
24	178.	230.	16.
25	154.	274.	10.
26	94.	334.	4.
27	99.	270.	6.
28	101.	232.	3.
29	91.	194.	8.
30	84.	186.	4.
31	73.	36.	5.
32	76.	196.	6.
33	74.	205.	6.

SEP12

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	80.	27.
2	206.	196.	31.
3	170.	134.	20.
4	152.	90.	27.
5	160.	98.	27.
6	164.	118.	20.
7	147.	75.	31.
8	156.	104.	21.
9	256.	294.	25.
10	212.	177.	26.
11	168.	278.	13.
12	186.	313.	17.
13	125.	169.	10.
14	148.	228.	8.
15	119.	260.	7.
16	108.	245.	5.
17	114.	222.	8.
18	93.	88.	8.
19	119.	164.	13.
20	128.	279.	4.
21	191.	256.	9.
22	178.	245.	12.
23	154.	209.	5.
24	94.	340.	2.
25	99.	282.	4.
26	101.	248.	8
27	91.	214.	6.
28	84.	206.	1.
29	73.	99.	4.
30	76.	211.	4.
31	74.	224.	3.

APPENDIX C

Separation's SPSS Regression Output Listings

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07/16/82   15.28.15.   PAGE   1

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 1ST MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        37
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES=37/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS        ALL
```

00054400 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 1ST MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	290.	15.	278.
2	340.	13.	334.
3	274.	98.	243.
4	270.	86.	230.
5	262.	57.	232.
6	208.	47.	194.
7	149.	13.	149.
8	206.	40.	170.
9	170.	41.	158.
10	152.	22.	139.
11	160.	19.	164.
12	164.	28.	143.
13	147.	11.	143.
14	156.	25.	143.
15	256.	77.	235.
16	212.	53.	191.
17	163.	49.	140.
18	146.	84.	152.
19	125.	36.	117.
20	148.	42.	125.
21	119.	42.	104.
22	108.	57.	86.
23	114.	47.	88.
24	93.	26.	86.
25	119.	25.	105.
26	128.	49.	101.
27	191.	74.	144.
28	178.	54.	159.
29	154.	49.	126.
30	94.	53.	74.
31	99.	43.	77.
32	101.	46.	77.
33	91.	58.	66.
34	84.	62.	66.
35	73.	29.	67.
36	76.	35.	46.
37	74.	35.	59.

FILE   NONAME   (CREATION DATE = 07/15/82)   M U L T I P L E   R E G R E S S I O N

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	160.5135	67.2593	37
NOSPD	44.1081	28.7053	37
SPD	141.2162	66.3849	37

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.19485	
SPD	.98768	.87289
	ACCOMP	NOSPD

SEPARATION PROJECTIONS, 1ST MONTH

87/15/82   15.28.15.   PAGE   5

FILE   NONAME   (CREATION DATE = 87/15/82)
* * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

MEAN RESPONSE   160.51351   STD. DEV.   67.25929

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

MULTIPLE R	.98768	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.97551	REGRESSION	1.	158869.58926	158869.58926	1394.41277	#
ADJUSTED R SQUARE	.97481	RESIDUAL	35.	3987.65399	113.93297		
STD DEVIATION	16.67394	COEFF OF VARIABILITY	6.6 PCT				

---------- VARIABLES IN THE EQUATION ---------- | --------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	F				VARIABLE	PARTIAL	TOLERANCE	F	
			SIGNIFICANCE	BETA ELASTICITY						SIGNIFICANCE	
SPD	1.8896918	.26798118E-81	1394.4128	.9876813			NOSPD	.79229	.99488	57.338818	
			#	.88839						.888	
(CONSTANT)	19.199722	4.1713884	21.185888								
			.888								

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

MULTIPLE R	.99543	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.99088	REGRESSION	2.	161272.74719	88686.37355	1847.99181	.888
ADJUSTED R SQUARE	.99035	RESIDUAL	34.	1484.49614	43.66165		
STD DEVIATION	6.68778	COEFF OF VARIABILITY	4.1 PCT				

---------- VARIABLES IN THE EQUATION ---------- | --------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	F				VARIABLE	PARTIAL	TOLERANCE	F	
			SIGNIFICANCE	BETA ELASTICITY						SIGNIFICANCE	
SPD	.99161232	.16632636E-81	3554.3622	.9787287							
			.888	.87248							
NOSPD	.48377773	.53327143E-81	57.338818	.1243882							
			.888	.11896							
(CONSTANT)	2.6719825	3.3812732	.62442559								
			.435								

ALL VARIABLES ARE IN THE EQUATION.

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FILE NONAME (CREATION DATE = 87/15/82)
* * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * *
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	.99161232	.16632636E-01	59.618472	.95781873	: 1.0254139
NOSPD	.48377773	.533:7147E-01	7.5717112	.29548793	: .51215152
CONSTANT	2.6719825	3.3812732	.79826685	-4.1996714	: 9.5434764

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.88284	
SPD	-.88886	.88828

FILE NONAME (CREATION DATE = 87/15/82)
* * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * *
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		1394.41277	0 .000	.98768	.97551	.97551	.98768	1394.41277	0. .000
2	NOSPD		57.33081	.000	.99543	.99088	.01537	.19485	1847.99181	.000

SEPARATION PROJECTIONS, 1ST MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

07/15/82   15.28.16.   PAGE   8

M U L T I P L E   R E G R E S S I O N

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	290.0000	284.3968	5.603207			
2.	340.0000	339.1195	.8804738			
3.	274.0000	279.9737	-5.973691			
4.	270.0000	265.4676	4.532308			
5.	262.0000	255.7411	6.250709			
6.	208.0000	214.0222	-6.022245			
7.	149.0000	155.6712	-6.671348			
8.	206.0000	195.3304	10.67000			
9.	170.0000	175.9045	-5.901535			
10.	152.0000	149.3891	2.610875			
11.	160.0000	169.8017	-9.801650			
12.	164.0000	155.7782	8.221768			
13.	147.0000	148.9140	-1.914019			
14.	156.0000	154.5669	1.433093			
15.	256.0000	266.7917	-10.79160			
16.	212.0000	213.4781	-1.478075			
17.	168.0000	169.2156	-1.215634			
18.	186.0000	187.3143	-1.314304			
19.	175.0000	183.2265	-8.226542			
20.	148.0000	143.5831	4.417093			
21.	119.0000	122.7582	-3.758248			
22.	160.0000	118.9659	-2.965892			
23.	114.0000	108.9113	5.088660			
24.	93.00000	98.44670	-5.446783			
25.	119.0000	116.8856	2.114361			
26.	128.0000	122.6699	5.398145			
27.	191.0000	175.3436	15.65637			
28.	178.0000	182.1423	-4.142258			
29.	154.0000	149.3034	4.616612			
30.	94.00000	97.45143	-3.451433			
31.	99.00000	96.38849	2.611507			
32.	101.0000	97.59983	3.400174			
33.	91.00000	91.53742	-.5374235			
34.	84.00000	93.15253	-9.152534			
35.	73.00000	80.81948	-7.819482			
36.	76.00000	62.41829	13.58171			
37.	74.00000	75.30925	-1.309250			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   37.
NUMBER OF 2 S.D. OUTLIERS   2. OR   5.41 PERCENT OF THE TOTAL

VON NEUMANN RATIO   2.50267   DURBIN-WATSON TEST   2.61296

NUMBER OF POSITIVE RESIDUALS   17.
NUMBER OF NEGATIVE RESIDUALS   20.
NUMBER OF RUNS OF SIGNS   24.

EXPECTED NUMBER OF RUNS OF SIGNS   19.
EXPECTED S.D. OF RUN DISTRIBUTION   2.97856
UNIT NORMAL DEVIATE   1.71949
Z (EXPECTED-OBSERVED)/S.D.
PROBABILITY OF OBTAINING .GE. ABS(Z)   .04276

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VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 2ND MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        36
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES=36/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS        ALL
```

89054800 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 2ND MONTH

FILE NONAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	34∅.	14.	333.
2	274.	117.	25∅.
3	27∅.	134.	222.
4	262.	7∅.	231.
5	2∅8.	53.	191.
6	149.	12.	154.
7	2∅6.	5∅.	1∅6.
8	17∅.	46.	163.
9	16∅.	16∅.	151.
1∅	163.	25.	166.
11	164.	33.	141.
12	147.	11.	153.
13	156.	25.	154.
14	256.	86.	251.
15	212.	52.	192.
16	168.	66.	155.
17	186.	95.	153.
18	125.	44.	119.
19	148.	46.	126.
2∅	119.	62.	1∅2.
21	1∅8.	77.	85.
22	114.	75.	92.
23	93.	26.	85.
24	119.	34.	1∅5.
25	128.	54.	1∅7.
26	191.	1∅2.	142.
27	178.	72.	15∅.
28	154.	52.	129.
29	94.	7∅.	77.
3∅	99.	47.	81.
31	1∅1.	48.	86.
32	91.	61.	72.
33	84.	68.	71.
34	73.	29.	7∅.
35	76.	46.	47.
36	74.	49.	63.

SEPARATION PROJECTIONS, 2ND MONTH

07/15/82   15.30.22.   PAGE   4

FILE NONAME (CREATION DATE = 07/15/82) ***** M U L T I P L E   R E G R E S S I O N *******

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	156.9167	64.5035	36
NOSPD	54.7500	28.4579	36
SPD	140.4167	62.9228	36

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.30462	
SPD	.97985	.15483
	ACCOMP	NOSPD

SEPARATION PROJECTIONS, 2ND MONTH

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD.SPD

MEAN RESPONSE   156.91667   STD. DEV.   64.58354

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

MULTIPLE R	.97985	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.96010	REGRESSION	1.	139014.51055	139014.51055	818.15791	.000
ADJUSTED R SQUARE	.95893	RESIDUAL	34.	5810.23945	170.88940		
STD DEVIATION	13.07247	COEFF OF VARIABILITY	8.3 PCT				

--------- VARIABLES IN THE EQUATION --------- | --------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	1.0044633	.35116846E-01	.9798476 .89884	818.15791 .000		NOSPD	.77488	.97603	49.589517 0
(CONSTANT)	15.873279	5.3908807		8.6698954 .006					

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

MULTIPLE R	.99299	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.98606	REGRESSION	2.	143303.17326	71651.58663	1018.48986	.000
ADJUSTED R SQUARE	.98309	RESIDUAL	33.	2321.57674	70.35081		
STD DEVIATION	8.38754	COEFF OF VARIABILITY	5.3 PCT				

--------- VARIABLES IN THE EQUATION --------- | --------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	.97959662	.22806655E-01	.9555903 .67659	1844.8939					
NOSPD	.35510948	.50427486E-01	.1566682 .12398	49.589517 0					
(CONSTANT)	-.77268983E-01	4.1345420		.3492646E-03 .985					

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 2ND MONTH

FILE NONAME (CREATION DATE = 07/15/82)   07/15/82   15.30.22.   PAGE 6
* MULTIPLE REGRESSION *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	.97959662	.22800655E-01	42.952228	.93319613	1.0259971
NOSPD	.35519948	.504./480C-01	7.0419025	.25251398	.4570497
CONSTANT	-.77268903E-01	4.1345420	-.18688625E-01	-8.4890579	8.3345201

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.00254	
SPD	-.00018	.00052
	NOSPD	SPD

SEPARATION PROJECTIONS, 2ND MONTH

FILE NONAME (CREATION DATE = 07/15/82)   07/15/82   15.30.22.   PAGE 7
* MULTIPLE REGRESSION *
DEPENDENT VARIABLE..   ACCOMP   NOSPD.SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		818.15791	0	.97985	.96010	.96010	.97985	818.15791	.000
2	NOSPD		49.58952	0	.99200	.98406	.02396	.38452	1018.48906	.000

SEPARATION PROJECTIONS, 2ND MONTH

FILE. NONAME   (CREATION DATE = 87/15/82)

**   **   **   **   **   **   **   M U L T I P L E   R E G R E S S I O N ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** **

07/15/82   15.30.22.   PAGE   8

			-2SD	0.0	+2SD
OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL		
1.	340.0000	331.0999	8.900062
2.	274.0000	286.3697	-12.36969
3.	270.0000	264.9779	5.022159
4.	262.0000	251.0672	10.93279
5.	208.0000	205.8465	2.153513
6.	149.0000	155.0419	-6.041924
7.	206.0000	199.8032	6.116324
8.	170.0000	175.9320	-5.932016
9.	152.0000	154.9440	-2.944010
10.	160.0000	171.4135	-11.41351
11.	164.0000	149.7645	14.23563
12.	147.0000	153.7072	-6.707210
13.	156.0000	159.6503	-3.650347
14.	256.0000	276.3469	-20.34090
15.	212.0000	206.4710	5.529026
16.	168.0000	175.1974	-7.197432
17.	186.0000	183.5364	2.463586
18.	125.0000	132.1195	-7.119546
19.	148.0000	139.6869	8.313059
20.	119.0000	121.8584	-2.650374
21.	108.0000	110.5319	-2.531873
22.	114.0000	116.6700	-2.670031
23.	93.0000	92.42129	.5707100
24.	119.0000	114.8541	4.145902
25.	128.0000	123.9155	4.004519
26.	191.0000	175.2466	15.75338
27.	178.0000	172.4301	5.569094
28.	154.0000	144.7554	9.243612
29.	94.0000	100.2093	-6.209334
30.	99.0000	95.96030	3.039797
31.	101.0000	101.2133	-.2132951
32.	91.0000	92.11537	-1.115366
33.	84.0000	93.62154	-9.621535
34.	73.0000	73.79267	-5.792669
35.	76.0000	62.29881	13.70119
36.	74.0000	79.83760	-5.837682

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   36.   OR   2.78 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   1.

VON NEUMANN RATIO   2.43761   DURBIN-WATSON TEST   2.36989

NUMBER OF POSITIVE RESIDUALS   17.
NUMBER OF NEGATIVE RESIDUALS   19.
NUMBER OF RUNS OF SIGNS   20.

EXPECTED NUMBER OF RUNS OF SIGNS   19.
EXPECTED S.D. OF RUN DISTRIBUTION   2.94744
UNIT NORMAL DEVIATE-
   Z-(EXPECTED-OBSERVED)/S.D.   .52777
PROBABILITY OF OBTAINING .GE. ABS(Z)   .29003

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VERSION 8.0 -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 3RD MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        35
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES=35/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/

STATISTICS        ALL
```

98054405 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 3RD MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	146.	234.
2	278.	141.	218.
3	262.	88.	226.
4	208.	67.	187.
5	149.	16.	153.
6	206.	54.	177.
7	170.	51.	158.
8	152.	28.	150.
9	160.	39.	149.
10	164.	47.	156.
11	147.	16.	133.
12	156.	31.	143.
13	256.	48.	158.
14	212.	63.	238.
15	168.	90.	191.
16	106.	123.	154.
17	125.	47.	150.
18	148.	59.	109.
19	119.	69.	122.
20	100.	78.	93.
21	114.	73.	81.
22	93.	32.	89.
23	119.	35.	82.
24	128.	76.	101.
25	191.	110.	104.
26	178.	97.	138.
27	154.	70.	145.
28	94.	98.	106.
29	99.	49.	73.
30	101.	49.	79.
31	91.	76.	81.
32	84.	80.	70.
33	73.	24.	66.
34	76.	85.	69.
35	74.	60.	45.

SEPARATION PROJECTIONS, 3RD MONTH

07/15/82   16.31.61.   PAGE   4

FILE NONAME (CREATION DATE = 07/15/82) .... M U L T I P L E   R E G R E S S I O N ....

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	151.6857	57.1756	35
NOSPD	57.3429	32.9464	35
SPD	129.2088	52.4661	35

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.49526	
SPD	.96987	.32762
	ACCOMP	NOSPD

SEPARATION PROJECTIONS, 3RD MONTH

07/15/82   15.31.51.   PAGE   5

FILE   NONAME   (CREATION DATE = 07/15/82)
DEPENDENT VARIABLE..   ACCOMP   NOSPD.SPD   * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * *

MEAN RESPONSE   151.68571   STD. DEV.   57.17557

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

MULTIPLE R	.96987	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.94064	REGRESSION	1.	104650.06703	104650.06703	522.95041	0
ADJUSTED R SQUARE	.93084	RESIDUAL	33.	6597.47502	199.92349		
STD DEVIATION	14.13943	COEFF OF VARIABILITY	9.3 PCT				

------- VARIABLES IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F	BETA	
			SIGNIFICANCE	ELASTICITY	
SPD	1.0569239	.4621824 7E-01	522.95041	.9698671	
			0	.90025	
(CONSTANT)	15.131145	6.4319273	5.5342826		
			.025		

------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
				SIGNIFICANCE
NOSPD	.77116	.89267	46.952157	
				.000

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

MULTIPLE R	.98750	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.97594	REGRESSION	2.	108473.52850	54236.76425	649.05278	.000
ADJUSTED R SQUARE	.97444	RESIDUAL	32.	2674.01436	83.56295		
STD DEVIATION	9.14128	COEFF OF VARIABILITY	6.0 PCT				

------- VARIABLES IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F	BETA	
			SIGNIFICANCE	ELASTICITY	
SPD	.98592692	.31625973E-01	971.85542	.9047180	
			0	.83977	
NOSPD	.34509788	.50363339E-01	46.952157	.1908567	
			.000	.15321	
(CONSTANT)	1.0648785	4.6374599	.52640618E-01		
			.820		

------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	PARTIAL	TOLERANCE	F	
				SIGNIFICANCE

ALL VARIABLES ARE IN THE EQUATION.

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SEPARATION PROJECTIONS, 3RD MONTH

07/15/82   16.31.51.   PAGE   6

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	.98592692	.31625973E-01	31.174596	.92160693 : 1.0503469
NOSPD	.34549788	.50363339E-01	6.8521644	.24251111 : .44760454
CONSTANT	1.0040705	4.6374599	.22945207	-8.3021102 : 10.510275

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.00254	
SPD	-.00052	.00100

SEPARATION PROJECTIONS, 3RD MONTH

07/15/82   15.31.51.   PAGE   7

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		522.95041	0	.96987	.94064	.94064	.96987	522.95041	0
2	NOSPD		46.95216	.000	.98790	.97594	.03530	.49526	649.05278	.000

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SEPARATION PROJECTIONS, 3RD MONTH

07/15/82   15.31.51.   PAGE   8

FILE NONAME   (CREATION DATE = 07/15/82)   * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * *

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	274.0000	282.1553	-8.155269			
2.	270.0000	256.7675	13.23247			
3.	262.0000	254.2522	7.747823			
4.	248.0000	243.5540	-.5539713			
5.	149.0000	157.4325	-8.432464			
6.	206.0000	194.2064	11.79157			
7.	170.0000	174.4405	-4.440524			
8.	152.0000	154.0691	-2.069140			
9.	160.0000	168.3275	-8.327496			
10.	164.0000	148.4120	15.58804			
11.	147.0000	147.5732	-.5731940			
12.	156.0000	159.6512	-3.651151			
13.	256.0000	269.5343	-13.53428			
14.	212.0000	211.1173	.8827125			
15.	168.0000	186.7164	-18.71642			
16.	186.0000	191.4002	-5.400156			
17.	125.0000	124.7497	.2502064			
18.	148.0000	141.7079	6.292062			
19.	119.0000	116.5678	2.432964			
20.	160.0000	147.8418	.1502061			
21.	114.0000	114.0037	-.3719099E-02			
22.	93.0000	92.95322	.4670150E-01			
23.	119.0000	112.7211	6.278876			
24.	128.0000	129.8279	-1.827917			
25.	191.0000	175.0828	15.91724			
26.	178.0000	177.4930	.5020232			
27.	154.0000	129.7292	24.27082			
28.	94.0000	104.0956	-10.09555			
29.	99.0000	95.86210	3.137098			
30.	101.0000	97.83396	3.166045			
31.	91.0000	96.30640	-5.306402			
32.	84.0000	93.74309	-9.743086			
33.	73.0000	77.37539	-4.375385			
34.	76.0000	74.76411	1.235698			
35.	74.0000	80.92557	-6.925567			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
        R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   35.   OR   5.71 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   2.

VON NEUMANN RATIO   2.27823   DURBIN-WATSON TEST   2.21314

NUMBER OF POSITIVE RESIDUALS   17.
NUMBER OF NEGATIVE RESIDUALS   18.
NUMBER OF RUNS OF SIGNS   19.

EXPECTED NUMBER OF RUNS OF SIGNS   18.
EXPECTED S.D. OF RUN DISTRIBUTION   2.91176
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   .34834
PROBABILITY OF OBTAINING .GE. ABS(Z)   .36379

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S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME   SEPARATION PROJECTIONS, 4TH MONTH
VARIABLE LIST   ACCOMP,NOSPD,SPD
INPUT MEDIUM   DISK
N OF CASES   34
INPUT FORMAT   FREEFIELD
VAR LABELS   ACCOMP,NOSPD,SPD
LIST CASES   CASES=34/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION   METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS   ALL

89954899 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 4TH MONTH

FILE NONAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	270.	157.	195.
2	262.	97.	223.
3	208.	101.	180.
4	149.	22.	144.
5	206.	59.	167.
6	178.	53.	158.
7	152.	23.	146.
8	160.	45.	157.
9	164.	61.	128.
10	147.	20.	141.
11	156.	32.	147.
12	256.	113.	229.
13	212.	75.	187.
14	168.	111.	154.
15	186.	160.	148.
16	125.	61.	104.
17	148.	72.	111.
18	119.	34.	88.
19	188.	87.	79.
20	114.	83.	86.
21	93.	35.	79.
22	119.	64.	100.
23	128.	96.	101.
24	191.	134.	141.
25	178.	113.	145.
26	154.	105.	96.
27	94.	132.	73.
28	99.	72.	75.
29	101.	66.	79.
30	91.	93.	65.
31	84.	86.	69.
32	73.	30.	60.
33	76.	98.	39.
34	74.	98.	58.

SEPARATION PROJECTIONS, 4TH MONTH

07/15/82   16.33.33.   PAGE   3

SEPARATION PROJECTIONS, 4TH MONTH   07/15/82   16.33.33.   PAGE   4

FILE   NONAME   (CREATION DATE = 07/15/82)   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	148.0882	53.8648	34
NOSPD	80.5294	36.6724	34
SPD	121.6471	48.7603	34

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.31613	
SPD	.95846	.11816
	ACCOMP	NOSPD

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SEPARATION PROJECTIONS, 4TH MONTH

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

MEAN RESPONSE   148.08824   STD. DEV.   53.86489

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R   .95046   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANCE
R SQUARE   .91065   REGRESSION   1.   87957.60648   87957.60648   361.36535   0
ADJUSTED R SQUARE   .91611   RESIDUAL   32.   7789.12889   243.41028
STD DEVIATION   15.60161   COEFF OF VARIABILITY   10.5 PCT

----------- VARIABLES IN THE EQUATION -----------   -------- VARIABLES NOT IN THE EQUATION --------

VARIABLE   B   STD ERROR B   F   BETA   VARIABLE   PARTIAL   TOLERANCE   F   SIGNIFICANCE
                                           SIGNIFICANCE ELASTICITY   SIGNIFICANCE
SPD   1.0587902   .55698815E-01   361.36535   .9584616   NOSPD   .71639   .98694   32.671329
                                            0   .86975   .000
(CONSTANT) 19.288547   7.2847677   7.01000002
                                            .012

* *

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R   .98000   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANCE
R SQUARE   .96039   REGRESSION   2.   91954.40952   45977.20926   375.83528   .000
ADJUSTED R SQUARE   .95784   RESIDUAL   31.   3792.33477   122.33338
STD DEVIATION   11.06044   COEFF OF VARIABILITY   7.5 PCT

----------- VARIABLES IN THE EQUATION -----------   -------- VARIABLES NOT IN THE EQUATION --------

VARIABLE   B   STD ERROR B   F   BETA   VARIABLE   PARTIAL   TOLERANCE   F   SIGNIFICANCE
                                           SIGNIFICANCE ELASTICITY   SIGNIFICANCE
SPD   1.0319428   .39765099E-01   673.45197   .9341584
                                            0   .84769
NOSPD   .38221284   .52872459E-01   32.671329   .2057533
                                           .000   .16434
(CONSTANT) -1.7014927 6.3450890   .78032174E-01
                                            .781

ALL VARIABLES ARE IN THE EQUATION.

FILE NONAME (CREATION DATE = 07/15/82)   07/15/82   16.33.33.   PAGE   6

* * * * * * * * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * * * * * * * *

DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	1.0319420	.39765089E-01	25.9500953	.95084054 :	1.1130434
NOSPD	-.30221284	.52872459E-01	5.7158839	.19437875 :	.41004693
CONSTANT	-1.7814927	6.34503098	-.28077068	-14.722226 :	11.169240

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.00280	
SPD	-.00025	.00158

FILE NONAME (CREATION DATE = 07/15/82)   07/15/82   15.33.33.   PAGE   7

* * * * * * * * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * * * * * * * *

DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		361.35535	0	.95846	.91865	.91865	.95846	361.35535	0
2	NOSPD		32.67133	.000	.98000	.96039	.04174	.31613	375.83528	.000

SEPARATION PROJECTIONS, 4TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)

* * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * *   07/15/82   16.33.33.   PAGE   8

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	270.0000	246.8946	23.10539			R
2.	262.0000	257.6562	4.343788			
3.	200.0000	214.4916	-6.491559			
4.	149.0000	153.4660	-4.466034			
5.	206.0000	189.3034	17.61662			
6.	170.0000	169.0271	.9729165			
7.	152.0000	155.8329	-3.832930			
8.	160.0000	173.0330	-13.03297			
9.	164.0000	148.7421	15.25794			
10.	147.0000	149.7666	-2.766582			
11.	156.0000	159.5848	-3.584788			
12.	256.0000	268.6833	-12.68327			
13.	212.0000	213.8576	-1.85761			
14.	168.0000	198.6032	-22.60320			
15.	186.0000	191.0444	-5.044438			
16.	125.0000	123.9755	1.024544			
17.	148.0000	134.5234	13.47661			
18.	119.0000	114.4153	4.584721			
19.	108.0000	106.0344	1.965560			
20.	114.0000	112.0492	1.950817			
21.	93.00000	90.31937	2.600628			
22.	119.0000	120.7543	-1.754326			
23.	128.0002	131.4571	-3.457079			
24.	191.0000	184.2188	6.781154			
25.	178.0000	182.0001	-4.000144			
26.	154.0000	129.0173	24.98272			
27.	94.00000	113.4424	-19.44237			
28.	99.00000	97.37348	1.626528			
29.	101.0000	99.68797	1.312029			
30.	91.00000	93.40053	-2.400530			
31.	84.00000	95.41281	-11.41281			
32.	73.00000	69.20141	3.798589			
33.	76.00000	68.03118	7.918897			
34.	74.00000	87.68000	-13.60000		R	

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   34.
NUMBER OF 2 S.D. OUTLIERS   3. OR   8.82 PERCENT OF THE TOTAL

VON NEUMANN RATIO   2.19184   DURBIN-WATSON TEST   2.12738

NUMBER OF POSITIVE RESIDUALS   17.
NUMBER OF NEGATIVE RESIDUALS   17.
NUMBER OF RUNS OF SIGNS   16.

EXPECTED NUMBER OF RUNS OF SIGNS   18.
EXPECTED S.D. OF RUN DISTRIBUTION   2.87896
UNIT NORMAL DEVIATE-
  Z=(EXPECTED-OBSERVED)/S.D.   -.52247
  PROBABILITY OF OBTAINING .GE. ABS(Z)   .30067

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VOGELBACK COMPUTING CENTER
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VERSION 8.0 -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 5TH MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        33
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES=33/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/

STATISTICS        ALL
```

80054498 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 5TH MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	108.	209.
2	208.	112.	165.
3	149.	37.	148.
4	206.	85.	153.
5	170.	59.	144.
6	152.	26.	134.
7	168.	51.	149.
8	164.	66.	122.
9	147.	26.	130.
10	156.	37.	139.
11	256.	134.	213.
12	212.	85.	167.
13	168.	127.	143.
14	186.	100.	132.
15	125.	82.	93.
16	148.	89.	104.
17	119.	97.	80.
18	108.	106.	74.
19	114.	97.	81.
20	93.	39.	74.
21	119.	73.	88.
22	128.	146.	94.
23	191.	152.	129.
24	178.	146.	136.
25	154.	115.	83.
26	94.	104.	69.
27	99.	112.	65.
28	101.	77.	78.
29	91.	105.	61.
30	84.	94.	67.
31	73.	37.	54.
32	76.	109.	37.
33	74.	110.	51.

SEPARATION PROJECTIONS, 5TH MONTH

07/15/82   15.35.18.   PAGE   4

FILE NONAME (CREATION DATE = 07/15/82)   * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	144.3939	50.1354	33
NOSPD	94.0303	41.8124	33
SPD	110.6061	44.8263	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.15286	
SPD	.95797	-.01777
	ACCOMP	NOSPD

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82   15.35.15.   PAGE   5

FILE NONAME   (CREATION DATE = 87/15/82)
* * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

MEAN RESPONSE   144.39394   STD. DEV.   58.13548

VARIABLE(S) ENTERED ON STEP NUMBER   1.. SPD

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.95797	REGRESSION	1.	73814.63362	73814.63362	345.69787	8
R SQUARE	.91771	RESIDUAL	31.	6619.24517	213.52484		
ADJUSTED R SQUARE	.91585	COEFF OF VARIABILITY	18.1 PCT				
STD DEVIATION	14.61246						

------------------ VARIABLES IN THE EQUATION ------------------   ------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	1.8714525	.67626874E-81	345.69787	.9579696 .82873		NOSPD	.5895#	.99968	16.978806 .888
(CONSTANT)	25.884882	6.8627182	14.226518 .881						

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2.. NOSPD

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.97278	REGRESSION	2.	76114.92228	38857.46114	264.35178	.888
R SQUARE	.9463#	RESIDUAL	38.	4318.95651	143.96522		
ADJUSTED R SQUARE	.94272	COEFF OF VARIABILITY	8.3 PCT				
STD DEVIATION	11.99855						

------------------ VARIABLES IN THE EQUATION ------------------   ------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	1.8748136	.47325915E-81	515.78443 .8	.9689747 .82331					
NOSPD	.2828#526	.58736878E-81	16.978886 .888	.1691376 .13287					
(CONSTANT)	6.4432864	7.4437992	.74922937 .394						

ALL VARIABLES ARE IN THE EQUATION.

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SEPARATION PROJECTIONS, 5TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	1.0748136	.4732-.915E-01	22.710888	.97816114	1.1714668
NOSPD	.29200526	.507308700E-01	3.9972599	.99188377E-01	.30642214
CONSTANT	6.4432864	7.4437992	.86558037	-0.7598597	21.645473

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.08257	
SPD	.00094	.00224

SEPARATION PROJECTIONS, 5TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD	345.69787	.0	.95797	.91771	.91771	.95797	345.69787	.0
2	NOSPD	15.97809	.000	.97278	.94638	.02868	.15205	264.36178	.000

FILE NONAME (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * *

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	262.0000	252.9822	9.017793			
2.	208.0000	206.5016	1.498368			
3.	149.0000	164.4209	-15.42098			
4.	206.0000	188.1201	17.87187			
5.	170.0000	173.1019	-3.101069			
6.	152.0000	155.7412	-3.741168			
7.	160.0000	176.9335	-16.93349			
8.	164.0000	150.9556	13.04439			
9.	147.0000	151.4419	-4.441905			
10.	156.0000	163.3461	-7.346205			
11.	256.0000	262.5544	-6.554398			
12.	212.0000	203.1755	8.024483			
13.	163.0000	185.8970	-17.89781			
14.	186.0000	184.8235	1.176458			
15.	125.0000	123.0309	1.969102			
16.	148.0000	136.2735	11.72652			
17.	119.0000	112.1004	6.899599			
18.	183.0000	187.4760	-.5232333			
19.	114.0000	113.1752	.8247857			
20.	93.00000	93.00001	-.0000145			
21.	119.0000	115.8316	3.168417			
22.	128.0000	137.0852	-9.085248			
23.	191.0000	175.9206	15.07945			
24.	178.0000	182.2274	-4.227417			
25.	154.0000	118.9753	35.02466			
26.	94.00000	117.9215	-23.92151			
27.	99.00000	99.02028	-.2027623E-01			
28.	101.0000	97.29616	3.703840			
29.	91.00000	93.36139	-2.361385			
30.	84.00000	97.51941	-13.51941			
31.	73.00000	71.98603	1.013967			
32.	76.00000	68.31700	7.682919			
33.	74.00000	83.56728	-9.567276			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
      R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   33.
NUMBER OF 2 S.D. OUTLIERS   1. OR   3.03 PERCENT OF THE TOTAL

VON NEUMANN RATIO   2.91268   DURBIN-WATSON TEST   2.82442

NUMBER OF POSITIVE RESIDUALS   17.
NUMBER OF NEGATIVE RESIDUALS   16.
NUMBER OF RUNS OF SIGNS   20.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.82437
UNIT NORMAL DEVIATE-
   Z-(EXPECTED-OBSERVED)/S.D.   1.06755
PROBABILITY OF OBTAINING .GE. ABS(Z)   .14286

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VERSION 8.# -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 6TH MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        33
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES=33/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS        ALL
```

88854#88 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 6TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	122.	155.
2	208.	133.	125.
3	149.	42.	101.
4	206.	123.	105.
5	170.	70.	97.
6	152.	30.	93.
7	160.	52.	96.
8	164.	70.	88.
9	147.	34.	99.
10	156.	47.	102.
11	256.	155.	156.
12	212.	101.	121.
13	168.	152.	89.
14	186.	207.	111.
15	125.	09.	64.
16	148.	123.	68.
17	119.	131.	54.
18	148.	126.	49.
19	114.	109.	48.
20	93.	41.	53.
21	119.	80.	52.
22	128.	169.	67.
23	191.	108.	89.
24	178.	164.	79.
25	154.	139.	61.
26	94.	215.	35.
27	99.	166.	40.
28	101.	130.	38.
29	91.	112.	39.
30	84.	101.	40.
31	73.	46.	37.
32	76.	130.	27.
33	74.	128.	28.

SEPARATION PROJECTIONS, 6TH MONTH   07/15/82   16.36.36.   PAGE   3

SEPARATION PROJECTIONS, 6TH MONTH   07/15/82   16.36.36.   PAGE   4

FILE NONAME (CREATION DATE = 07/15/82) * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	144.3939	50.1354	33
NOSPD	112.3939	49.8642	33
SPD	75.6970	35.4352	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.13113
SPD	.95124 -.06689
	ACCOMP NOSPD

SEPARATION PROJECTIONS, 6TH MONTH

FILE NONAME (CREATION DATE = Ø7/15/82)
DEPENDENT VARIABLE.. ACCOMP   NOSPD.SPD

MEAN RESPONSE   144.39394   STD. DEV.   5Ø.1354Ø

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.95124	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.9Ø486	REGRESSION	1.	72781.3Ø795	72781.3Ø795	294.83171	Ø
ADJUSTED R SQUARE	.9Ø179	RESIDUAL	31.	7652.57Ø84	246.85712		
STD DEVIATION	15.71169	COEFF OF VARIABILITY	1Ø.9 PCT				

------- VARIABLES IN THE EQUATION ------- | ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	1.3456595	.78381329E-Ø1	.9512497 .7Ø555	294.83171 Ø		NOSPD	.63281	.99553	2Ø.Ø37528 .ØØØ
(CONSTANT)	42.516454	6.5332784		42.349837 Ø					

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.971Ø6	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.94296	REGRESSION	2.	75845.77919	37922.88959	247.96469	.ØØØ
ADJUSTED R SQUARE	.93916	RESIDUAL	3Ø.	4588.Ø996Ø	152.93665		
STD DEVIATION	12.36676	COEFF OF VARIABILITY	8.6 PCT				

------- VARIABLES IN THE EQUATION ------- | ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	1.3643733	.61832857E-Ø1	.9643261 .71526	486.88659 .ØØØ					
NOSPD	.19669262	.4394Ø61ØE-Ø1	.1966284 .1531Ø	2Ø.Ø37528 .ØØØ					
(CONSTANT)	19.ØØ7955	7.36Ø1566		6.6Ø77129 .Ø15					

ALL VARIABLES ARE IN THE EQUATION.

FILE NONAME (CREATION DATE = 07/15/82)

* * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * *

DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	1.3643733	.61832857E-01	22.065507	1.2380938	1.4906529
NOSPD	.19669262	.43940610E-01	4.4763288	.10695392	.28643132
CONSTANT	19.607955	7.3501566	2.5860613	3.9969328	34.018978

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.00193	
SPD	.00018	.00302

FILE NONAME (CREATION DATE = 07/15/82)

* * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * *

DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		294.83171	0	.95124	.90486	.90486	.95124	294.83171	0
2	NOSPD		20.03752	.000	.97106	.94296	.03810	.13113	247.96469	.000

FILE NONAME (CREATION DATE = 87/15/82)

. MULTIPLE REGRESSION . . . .

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	262.0000	254.4823	7.517681			
2.	208.0000	215.7147	-7.714738			
3.	149.0000	165.8708	-16.87075			
4.	206.0000	186.4603	19.53965			
5.	178.0000	165.1207	4.879350			
6.	152.0000	151.7955	.2045478			
7.	168.0000	168.2158	-.2150090			
8.	164.0000	152.0413	11.15071			
9.	147.0000	160.7685	-13.76846			
10.	156.0000	167.4186	-11.41859			
11.	256.0000	262.3375	-6.337549			
12.	212.0000	203.9631	8.036919			
13.	168.0000	170.3345	-2.334459			
14.	186.0000	211.1600	-25.16077			
15.	125.0000	123.8335	1.165409			
16.	148.0000	135.9705	12.02147			
17.	119.0000	116.8773	2.122693			
18.	108.0000	110.6455	-2.645518			
19.	114.0000	105.9374	8.062630			
20.	93.0000	99.3841	-6.384138			
21.	119.0000	105.6908	13.30922			
22.	128.0000	143.6624	-15.66702			
23.	191.0000	175.8419	15.15015			
24.	170.0000	159.0510	10.94896			
25.	154.0000	129.5758	24.42500			
26.	94.0000	109.8499	-15.84994			
27.	99.0000	106.2339	-7.233063			
28.	101.0000	84.5094	15.44000			
29.	91.0000	94.2494	-3.248898			
30.	84.0000	93.4884	-9.448843			
31.	73.0000	78.53763	-5.537629			
32.	76.0000	81.4160	-5.416076			
33.	74.0000	82.3870	-8.387064			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   33.
NUMBER OF 2 S.D. OUTLIERS   1. OR   3.03 PERCENT OF THE TOTAL

VON NEUMANN RATIO   2.12426   DURBIN-WATSON TEST   2.05999

NUMBER OF POSITIVE RESIDUALS   15:
NUMBER OF NEGATIVE RESIDUALS   18:
NUMBER OF RUNS OF SIGNS   18.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBU...   2.80293
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   .40542
PROBABILITY OF OBTAINING .GE. A...   .34258

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VERSION 8.0 -- JUNE 18, 1979

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     RUN NAME        SEPARATION PROJECTIONS, 7TH MONTH
     VARIABLE LIST   ACCOMP,NOSPD,SPD
     INPUT MEDIUM    DISK
     N OF CASES      32
     INPUT FORMAT    FREEFIELD
     VAR LABELS      ACCOMP,NOSPD,SPD
     LIST CASES      CASES-32/VARIABLES-ACCOMP,NOSPD,SPD
     REGRESSION      METHOD=STEPWISE/VARIABLES-ACCOMP,NOSPD,SPD/
                     REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/
     STATISTICS      ALL
```

#####54855 CM NEEDED FOR REGRESSION

OPTION - 1
(IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 7TH MONTH
FILE NONAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	208.	158.	80.
2	149.	49.	51.
3	206.	132.	72.
4	178.	85.	68.
5	152.	39.	60.
6	160.	54.	63.
7	164.	75.	53.
8	147.	36.	62.
9	156.	55.	63.
10	256.	198.	83.
11	212.	119.	60.
12	160.	162.	46.
13	186.	229.	58.
14	125.	99.	43.
15	148.	145.	37.
16	119.	142.	28.
17	108.	139.	28.
18	114.	124.	23.
19	93.	46.	24.
20	119.	92.	34.
21	128.	191.	41.
22	191.	197.	48.
23	178.	179.	41.
24	154.	161.	35.
25	94.	251.	17.
26	99.	186.	22.
27	101.	153.	14.
28	91.	135.	19.
29	84.	109.	18.
30	73.	53.	11.
31	76.	145.	18.
32	74.	154.	17.

SEPARATION PROJECTIONS, 7TH MONTH

SEPARATION PROJECTIONS, 7TH MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	148.7188	46.2818	32
NOSPD	127.8758	57.7435	32
SPD	41.7813	28.8168	32

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.13877	
SPD	.90155	-.13820
	ACCOMP	NOSPD

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SEPARATION PROJECTIONS, 7TH MONTH

07/15/82   15.38.12.   PAGE   5

FILE NONAME (CREATION DATE = 07/15/82)   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

MEAN RESPONSE   140.71875   STD. DEV.   46.28099

VARIABLE(S) ENTERED ON STEP NUMBER   1.. SPD

MULTIPLE R	.90155	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.81278	REGRESSION	1.	53782.26089	53782.26089	130.24223	.000
ADJUSTED R SQUARE	.80654	RESIDUAL	30.	12388.28786	412.94826		
STD DEVIATION	20.32093	COEFF OF VARIABILITY	14.4 PCT				

----------- VARIABLES IN THE EQUATION ----------   -------- VARIABLES NOT IN THE EQUATION -----------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	2.0009003	.17632729	.90155 .59409	130.24223 .000		NOSPD	.61469	.99098	17.602538 .000
(CONSTANT)	57.118636	8.1587050		49.012253 .000					

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2.. NOSPD

MULTIPLE R	.93995	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.88350	REGRESSION	2.	58461.48879	29230.74449	109.96158	.000
ADJUSTED R SQUARE	.87546	RESIDUAL	29.	7708.97996	265.82698		
STD DEVIATION	16.30420	COEFF OF VARIABILITY	11.6 PCT				

----------- VARIABLES IN THE EQUATION ----------   -------- VARIABLES NOT IN THE EQUATION -----------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	2.0032571	.14203424	.9386525 .61855	215.12934 0					
NOSPD	.21482814	.512039590E-01	.2684990 .19522	17.602538 .000					
(CONSTANT)	26.206515	9.8557840		7.0702731 .013					

ALL VARIABLES ARE IN THE EQUATION.

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FILE NONAME (CREATION DATE = 07/15/82) M U L T I P L E   R E G R E S S I O N
DEPENDENT VARIABLE.. ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	2.0832571	.14203424	14.667288	1.7927645	: 2.3737498
NOSPD	.21402814	.51203058E-01	4.1955378	.11010429	: .31955200
CONSTANT	26.206515	9.0557040	2.6589905	6.0491733	: 46.363857

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.00262	
SPD	.00101	.02017

FILE NONAME (CREATION DATE = 07/15/82) M U L T I P L E   R E G R E S S I O N
DEPENDENT VARIABLE.. ACCOMP   NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		130.24223	.000	.90155	.81278	.81278	.90155	130.24223	.000
2	NOSPD		17.60254	.000	.93995	.88360	.07071	.13077	109.96158	.000

FILE NONAME (CREATION DATE = 07/15/82)
* M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * *

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	208.0000	226.8099	-18.80993			
2.	149.0000	142.9792	6.020793			
3.	206.0000	204.5503	1.441658			
4.	178.0000	186.1204	-16.12039			
5.	152.0000	159.5802	-7.580239			
6.	160.0000	169.0524	-9.052433			
7.	164.0000	152.7313	11.26075			
8.	147.0000	163.1027	-16.10727			
9.	156.0000	169.2673	-13.26726			
10.	256.0000	241.6528	14.34717			
11.	212.0000	176.7665	35.23351			
12.	168.0000	156.8365	11.16150			
13.	186.0000	196.2311	-10.23107			
14.	125.0000	137.0546	-12.05456			
15.	148.0000	134.4371	13.56289			
16.	119.0000	115.0433	3.956690			
17.	108.0000	114.3908	-6.398026			
18.	114.0000	100.7601	13.23988			
19.	93.00000	86.08678	6.913220			
20.	119.0000	116.8014	2.190554			
21.	128.0000	152.6522	-24.65223			
22.	191.0000	168.5240	22.47600			
23.	178.0000	150.0743	27.92571			
24.	154.0000	133.7078	20.29216			
25.	94.00000	115.5437	-21.54375			
26.	99.00000	111.9962	-12.99621			
27.	101.0000	88.24002	12.75918			
28.	91.00000	94.79070	-3.790199			
29.	84.00000	87.12141	-3.121411			
30.	73.00000	68.50823	12.49177			
31.	76.00000	94.85522	-18.85522			
32.	74.00000	94.70542	-20.70542			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   32. OR   3.13 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   1. OR

VON NEUMANN RATIO   1.70799   DURBIN-WATSON TEST   1.65461

NUMBER OF POSITIVE RESIDUALS   16.
NUMBER OF NEGATIVE RESIDUALS   16.
NUMBER OF RUNS OF SIGNS   17.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.78243
UNIT NORMAL DEVIATE-
$Z = (EXPECTED-OBSERVED)/S.D.$ .17970
PROBABILITY OF OBTAINING .GE. ABS(Z)   .42869

VOGELBACK COMPUTING CENTER
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VERSION 8.8 -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 8TH MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        31
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES=31/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS        ALL
```

88854485 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 8TH MONTH

FILE   NONAME   (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPO	SPD
1	149.	56.	41.
2	286.	148.	68.
3	178.	94.	65.
4	152.	62.	54.
5	168.	58.	45.
6	164.	77.	46.
7	147.	37.	50.
8	196.	68.	56.
9	256.	228.	61.
10	212.	145.	49.
11	168.	192.	48.
12	186.	235.	48.
13	125.	113.	29.
14	148.	172.	27.
15	119.	158.	19.
16	108.	174.	16.
17	114.	145.	17.
18	93.	54.	21.
19	119.	185.	25.
20	128.	209.	34.
21	191.	208.	32.
22	178.	198.	33.
23	154.	178.	26.
24	94.	233.	10.
25	99.	221.	17.
26	101.	173.	7.
27	91.	152.	14.
28	84.	131.	14.
29	73.	68.	9.
30	76.	159.	12.
31	74.	165.	11.

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82   15.42.39.   PAGE   4

FILE   NONAME   (CREATION DATE = 57/15/82) * * * * * MULTIPLE REGRESSION * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	138.5484	45.2761	31
NOSPD	143.8323	63.7285	31
SPD	31.2983	16.9631	31

CORRELATION COEFFICIENTS.

A VALUE OF 99.0000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.89293	
SPD	.85111	-.29193
	ACCOMP	NOSPD

SEPARATION PROJECTIONS, 8TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)
. . . . M U L T I P L E   R E G R E S S I O N   . . . .
DEPENDENT VARIABLE.. ACCOMP   NOSPD,SPD

MEAN RESPONSE   138.54839   STD. DEV.   45.27607

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.85111						
R SQUARE	.72438	REGRESSION	1.	44547.88994	44547.88994	76.21958	0
ADJUSTED R SQUARE	.71488	RESIDUAL	29.	16945.78748	584.47543		
STD DEVIATION	24.17593	COEFF OF VARIABILITY	17.4 PCT				

------------ VARIABLES IN THE EQUATION ------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	2.2716959	.26025622	76.218584 0	.851871 .51305		NOSPD	.67995	.91478	24.075489 .000
(CONSTANT)	67.466638	9.2274145	53.458649 0						

. . . .

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.92293						
R SQUARE	.85179	REGRESSION	2.	52383.22398	26191.61199	80.46178	.000
ADJUSTED R SQUARE	.84121	RESIDUAL	28.	9114.45344	325.51619		
STD DEVIATION	18.04287	COEFF OF VARIABILITY	13.0 PCT				

------------ VARIABLES IN THE EQUATION ------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	2.5624754	.20383125	159.29108 .000	.9600543 .57872					
NOSPD	.26517414	.5484913E-01	24.075489 .000	.3731998 .27376					
(CONSTANT)	28.439248	11.882526	2.9990238 .094						

ALL VARIABLES ARE IN THE EQUATION.

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SEPARATION PROJECTIONS, 8TH MONTH

$7/15/82   16.42.38.   PAGE   6

FILE   NONAME   (CREATION DATE = $7/15/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.$ PCT CONFIDENCE INTERVAL	
SPD	2.5624754	.2830$125	12.621$89	2.1465848 :	2.9783661
NOSPD	.26517414	.54$4$138$E-$1	4.9$61685	.15445951 :	.37588876
CONSTANT	2$.439248	11.88$526	1.731769$	-3.7371$$2 :	44.615627

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.$$292	
SPD	.$$32$	.$4122
	NOSPD	SPD

SEPARATION PROJECTIONS, 8TH MONTH

$7/15/82   16.42.38.   PAGE   7

FILE   NONAME   (CREATION DATE = $7/15/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		76.21858	.$	.85111	.72438	.72438	.85111	76.21858	.$
2	NOSPD		24.$7$49	.$$$	.92293	.85179	.12741	.$9293	8$.46178	.$$$

FILE NONAME   (CREATION DATE - 07/15/82)   M U L T I P L E   R E G R E S S I O N   07/15/82   15.42.37.   PAGE   8

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	149.0000	140.3505	8.649507			
2.	206.0000	213.4335	-7.493547			
3.	170.0500	186.3018	-16.30177			
4.	152.0000	175.2537	-23.25372			
5.	160.0000	151.1307	8.069257			
6.	164.0000	158.7315	5.268473			
7.	147.0000	158.3745	-11.37446			
8.	156.0000	179.8483	-23.84832			
9.	256.0000	235.0886	20.91144			
10.	212.0000	184.4508	27.54921			
11.	168.0000	173.8517	-5.851700			
12.	186.0000	105.2542	.7468118			
13.	125.0000	124.7157	.2042464			
14.	148.0000	135.7368	12.76196			
15.	119.0000	111.0238	7.976205			
16.	108.0000	107.5792	.4240447			
17.	114.0000	102.4516	11.54842			
18.	93.00000	88.57064	4.429364			
19.	119.0000	112.3444	6.655581			
20.	128.0000	162.9848	-34.98481			
21.	191.0000	157.5947	33.40532			
22.	178.0000	155.3840	22.61598			
23.	154.0000	134.2646	19.73539			
24.	94.00000	121.1083	-27.10828			
25.	99.00000	122.6040	-23.60482			
26.	101.0000	84.25170	16.74838			
27.	91.00000	96.62037	-5.620373			
28.	84.00000	91.05172	-7.051717			
29.	73.00000	59.41198	13.58802			
30.	76.00000	93.35164	-17.35164			
31.	74.00000	92.38021	-18.38021			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   31.   # OR   # PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   0.

VON NEUMANN RATIO   2.01154   DURBIN-WATSON TEST   1.94665

NUMBER OF POSITIVE RESIDUALS   18.
NUMBER OF NEGATIVE RESIDUALS   13.
NUMBER OF RUNS OF SIGNS   14.

EXPECTED NUMBER OF RUNS OF SIGNS   16.
EXPECTED S.D. OF RUN DISTRIBUTION   2.66343
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   -.59952
PROBABILITY OF OBTAINING .GE. ABS(Z)   .27441

VOGELBACK COMPUTING CENTER
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S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.# -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 9TH MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        35
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD.SPD
LIST CASES        CASES=35/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                  REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS        ALL
```

88#5448# CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 9TH MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	254.	56.
2	278.	223.	60.
3	262.	151.	54.
4	208.	175.	46.
5	149.	63.	38.
6	206.	163.	55.
7	178.	111.	44.
8	152.	65.	48.
9	160.	73.	38.
10	164.	85.	35.
11	147.	39.	43.
12	156.	61.	48.
13	256.	240.	51.
14	212.	152.	37.
15	168.	236.	24.
16	186.	255.	29.
17	175.	120.	23.
18	148.	187.	21.
19	119.	173.	18.
20	188.	194.	15.
21	114.	174.	13.
22	93.	59.	17.
23	119.	111.	21.
24	128.	225.	22.
25	191.	220.	29.
26	178.	207.	25.
27	154.	192.	17.
28	94.	311.	7.
29	99.	245.	13.
30	101.	196.	7.
31	91.	159.	10.
32	84.	153.	12.
33	73.	71.	7.
34	76.	164.	11.
35	74.	170.	9.

SEPARATION PROJECTIONS, 9TH MONTH

SEPARATION PROJECTIONS, 9TH MONTH

FILE   NONAME   (CREATION DATE = 07/15/82)

* * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	151.6857	57.1756	35
NOSPD	162.2000	68.5148	35
SPD	28.6571	16.8749	35

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.21614	
SPD	.88600	-.12403
	ACCOMP	NOSPD

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SEPARATION PROJECTIONS, 9TH MONTH

07/15/82.   15.44.21.   PAGE   5

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

MEAN RESPONSE   151.68571   STD. DEV.   57.17557

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

MULTIPLE R   .80680
R SQUARE   .79514
ADJUSTED R SQUARE   .77863
STD DEVIATION   26.98111

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
REGRESSION	1.	87266.44806	87266.44806	120.58801	0
RESIDUAL	33.	23801.09468	723.66954		
COEFF OF VARIABILITY	17.7 PCT				

--------- VARIABLES IN THE EQUATION --------------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F	SIGNIFICANCE
SPD	3.0922289	.27339475	.8060016 .56719	120.58801	0
(CONSTANT)	65.650437	9.0586418		52.522945	0

--------- VARIABLES NOT IN THE EQUATION --------------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
NOSPD	.78007	.98462	32.320382	.000

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

MULTIPLE R   .94504
R SQUARE   .89311
ADJUSTED R SQUARE   .88642
STD DEVIATION   19.26873

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
REGRESSION	2.	99266.45699	49633.22849	133.67998	.000
RESIDUAL	32.	11801.08587	371.28393		
COEFF OF VARIABILITY	12.7 PCT				

--------- VARIABLES IN THE EQUATION --------------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F	SIGNIFICANCE
SPD	3.1413838	.19735187	.9271522 .59348	253.37456	0
NOSPD	.27633323	.4860661E-01	.311366 .29549	32.320382	.000
(CONSTANT)	16.841380	10.761542		2.4490989	.127

--------- VARIABLES NOT IN THE EQUATION --------------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE

ALL VARIABLES ARE IN THE EQUATION.

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SEPARATION PROJECTIONS, 9TH MONTH

07/16/82   15.44.21.   PAGE   6

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	3.1413838	.19735107	15.917744	2.7393928 :	3.5433748
NOSPD	.27633323	.4860b618E-01	5.6858947	.17732479 :	.37534167
CONSTANT	16.841380	10.761542	1.5649597	-5.0791642 :	38.761925

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.00236	.03095
SPD		

SEPARATION PROJECTIONS, 9TH MONTH

07/16/82   15.44.21.   PAGE   7

FILE   NONAME   (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		120.58081	.000	.88600	.78514	.78514	.88600	120.58081	.000
2	NOSPD		32.32030	.000	.94504	.89311	.10796	.21614	133.67998	.000

SEPARATION PROJECTIONS, 9TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)

MULTIPLE REGRESSION

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	274.0000	262.9475	11.05249			
2.	270.0000	292.0778	-22.07779			
3.	262.0000	228.2024	33.79758			
4.	288.0000	289.7933	-1.793358			
5.	149.0000	153.6230	-4.622958			
6.	206.0000	234.6598	-28.65981			
7.	170.0000	185.7353	-15.73526			
8.	152.0000	185.5895	-33.58946			
9.	160.0000	156.3863	3.613710			
10.	164.0000	150.2781	13.72186			
11.	147.0000	162.6979	-15.69788			
12.	156.0000	159.3531	-3.353059			
13.	256.0000	243.3719	12.62807			
14.	212.0000	175.0752	36.92477			
15.	168.0000	157.4492	10.55077			
16.	186.0000	178.4065	7.593516			
17.	125.0000	122.2532	2.746805			
18.	148.0000	134.4848	13.51525			
19.	119.0000	121.1919	-2.191937			
20.	108.0000	117.5708	-9.578784			
21.	114.0000	105.7614	8.238648			
22.	93.0000	86.54857	6.451435			
23.	119.0000	113.4834	5.516572			
24.	128.0000	148.1268	-20.12680			
25.	191.0000	168.7348	22.26518			
26.	178.0000	152.5770	25.42305			
27.	154.0000	123.3009	30.69912			
28.	94.0000	124.7787	-30.77870			
29.	99.0000	125.3810	-26.38101			
30.	101.0000	92.99238	8.007620			
31.	91.0000	92.19220	-1.192202			
32.	84.0000	96.81697	-12.81697			
33.	73.0000	58.45073	14.54927			
34.	76.0000	96.71525	-20.71525			
35.	74.0000	92.09048	-18.09048			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   35.   0 OR   0 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS

VON NEUMANN RATIO   1.82472   DURBIN-WATSON TEST   1.77258

NUMBER OF POSITIVE RESIDUALS   18.
NUMBER OF NEGATIVE RESIDUALS   17.
NUMBER OF RUNS OF SIGNS   16.

EXPECTED NUMBER OF RUNS OF SIGNS   18.
EXPECTED S.D. OF RUN DISTRIBUTION   2.91176
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   -.68196
PROBABILITY OF OBTAINING .GE. ABS(Z)   .24763

VOGELBACK COMPUTING CENTER
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VERSION 8.# -- JUNE 18, 1979

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RUN NAME          SEPARAYION PROJECTIONS, 18TH MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        34
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES-34/VARIABLES-ACCOMP,NOSPD,SPD
REGRESSION        METHOD-STEPWISE/VARIABLES-ACCOMP,NOSPD,SPD/
                  REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS        ALL
```

8#954488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATO..S
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 18TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	278.	235.	61.
2	260.	153.	47.
3	248.	187.	34.
4	149.	67.	35.
5	206.	171.	48.
6	178.	124.	34.
7	152.	77.	35.
8	168.	81.	37.
9	164.	101.	37.
10	147.	51.	38.
11	156.	66.	37.
12	256.	256.	39.
13	212.	168.	36.
14	168.	255.	28.
15	186.	288.	23.
16	125.	124.	15.
17	148.	196.	17.
18	119.	188.	13.
19	108.	213.	11.
20	114.	196.	8.
21	93.	73.	13.
22	119.	118.	17.
23	128.	249.	15.
24	191.	233.	22.
25	178.	219.	19.
26	154.	201.	11.
27	94.	326.	5.
28	99.	267.	6.
29	101.	215.	9.
30	91.	176.	9.
31	84.	164.	8.
32	73.	81.	6.
33	76.	177.	7.
34	74.	183.	6.

SEPARATION PROJECTIONS, 18TH MONTH

SEPARATION PROJECTIONS, 18TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)

* * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	148.0882	53.8648	34
NOSPD	172.6765	70.8446	34
SPD	22.3235	14.7766	34

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.12189	
SPD	.86862	-.24566
	ACCOMP	NOSPD

SEPARATION PROJECTIONS, 18TH MONTH

07/15/82   15.45.59.   PAGE   5

· · · · · · · · · · · · · · · M U L T I P L E   R E G R E S S I O N · · · · · · · · · · · · · · ·

DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

MEAN RESPONSE   148.80824   STD. DEV.   53.86408

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

MULTIPLE R   .86862
R SQUARE   .75458
ADJUSTED R SQUARE   .74683
STD DEVIATION   27.18208

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
REGRESSION	1.	72248.62484	72248.62484	98.34464	.000
RESIDUAL	32.	23586.11126	734.56598		
COEFF OF VARIABILITY	18.3 PCT				

-------- VARIABLES IN THE EQUATION --------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE
SPD	3.1663612	.31928985	.8686179 .47731	98.344637 .000
(CONSTANT)	77.483878	8.5893274		82.743706 .000

-------- VARIABLES NOT IN THE EQUATION --------

VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
NOSPD	.69639	.93565	29.189267 .000

· ·

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

MULTIPLE R   .93464
R SQUARE   .87356
ADJUSTED R SQUARE   .86548
STD DEVIATION   19.76288

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
REGRESSION	2.	83648.18898	41824.09545	107.08356	.000
RESIDUAL	31.	12186.63448	398.53659		
COEFF OF VARIABILITY	13.3 PCT				

-------- VARIABLES IN THE EQUATION --------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE
SPD	3.4851187	.24816987	.9560616 .52536	218.57218 .000
NOSPD	.27664215	.50993785E-01	.3559565 .31558	29.189267 .000
(CONSTANT)	23.554553	11.748598		4.0258933 .054

-------- VARIABLES NOT IN THE EQUATION --------

VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE

ALL VARIABLES ARE IN THE EQUATION.

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SEPARATION PROJECTIONS, 18TH MONTH   07/15/82   15.46.59.   PAGE   6

FILE   NONAME   (CREATION DATE - 07/15/82)
* * * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	3.4851187	.24016087	14.5111B6	2.9952087 : 3.9749468
NOSPD	.27064215	5.0809785C-01	5.4027892	.16847520 : .37280910
CONSTANT	23.554553	11.7405000	2.0062635	-.39037122 : 47.499477

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	NOSPD	SPD
NOSPD	.00251	
SPD	.00296	.05768

SEPARATION PROJECTIONS, 18TH MONTH   07/15/82   15.45.59.   PAGE   7

FILE   NONAME   (CREATION DATE - 07/15/82)
* * * * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD	98.34464	.000	.86862	.75450	.75450	.86862	98.34464	.000
2	NOSPD	29.18927	.000	.93464	.87356	.11906	.12109	107.00356	.000

SEPARATION PROJECTIONS, 18TH MONTH

FILE NONAME   (CREATION DATE = 07/15/82)   M U L T I P L E   R E G R E S S I O N

OBSERVATION	Y VALUE	Ŷ ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	270.0000	299.7477	-29.7477			
2.	262.0000	228.7634	33.23662			
3.	208.0000	192.6587	15.34133			
4.	149.0000	163.6667	-14.66673			
5.	206.0000	237.1701	-31.17006			
6.	170.0000	175.6802	-5.680217			
7.	152.0000	166.3737	-14.37315			
8.	160.0000	174.4260	-14.42596			
9.	164.0000	155.4430	8.557027			
10.	147.0000	166.3867	-19.38670			
11.	156.0000	145.9705	10.02950			
12.	256.0000	228.7596	27.24143			
13.	212.0000	194.4867	17.51329			
14.	168.0000	162.2747	5.729323			
15.	186.0000	179.4921	6.507913			
16.	125.0000	109.3910	15.60904			
17.	148.0000	135.8474	12.15257			
18.	119.0000	119.7418	-.7418211			
19.	108.0000	119.5376	-11.53764			
20.	114.0000	104.4814	9.518635			
21.	93.00000	80.61797	4.382026			
22.	119.0000	114.7373	4.262655			
23.	128.0000	143.2212	-15.22123			
24.	191.0000	163.2868	27.71321			
25.	178.0000	149.0424	28.95756			
26.	154.0000	116.2890	37.71007			
27.	94.00000	129.2895	-35.28949			
28.	99.00000	116.7267	-17.72672			
29.	101.0000	99.16021	1.831791			
30.	91.00000	102.5536	-11.55364			
31.	84.00000	95.82082	-11.82082			
32.	73.00000	66.38728	6.612728			
33.	76.00000	95.85404	-19.85404			
34.	74.00000	93.99278	-19.99278			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	34.	0 OR	0 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS		0 OR	0 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.63866   DURBIN-WATSON TEST   1.59047

NUMBER OF POSITIVE RESIDUALS   18.
NUMBER OF NEGATIVE RESIDUALS   16.
NUMBER OF RUNS OF SIGNS   15.

EXPECTED NUMBER OF RUNS OF SIGNS   18.
EXPECTED S.D. OF RUN DISTRIBUTION   2.86072
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   -.85334
PROBABILITY OF OBTAINING .GE. ABS(Z)   .19673

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VERSION 8.# -- JUNE 18, 1979

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RUN NAME          SEPARATION PROJECTIONS, 11TH MONTH
VARIABLE LIST     ACCOMP,NOSPD,SPD
INPUT MEDIUM      DISK
N OF CASES        33
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,NOSPD,SPD
LIST CASES        CASES-33/VARIABLES-ACCOMP,NOSPD,SPD
REGRESSION        METHOD-STEPWISE/VARIABLES-ACCOMP,NOSPD,SPD/
                  REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/
STAT STICS        ALL
```

8#854#8 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 11TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	167.	49.
2	208.	199.	29.
3	149.	75.	38.
4	206.	187.	37.
5	178.	128.	25.
6	152.	84.	38.
7	108.	88.	35.
8	164.	189.	23.
9	147.	69.	35.
10	156.	83.	23.
11	256.	267.	34.
12	212.	171.	29.
13	168.	275.	19.
14	186.	296.	22.
15	135.	144.	13.
16	148.	214.	13.
17	119.	172.	14.
18	108.	233.	8.
19	114.	210.	8.
20	93.	76.	18.
21	119.	145.	14.
22	128.	262.	8.
23	191.	243.	13.
24	178.	730.	16.
25	154.	284.	10.
26	94.	334.	4.
27	99.	276.	6.
28	141.	232.	3.
29	91.	194.	8.
30	84.	186.	4.
31	73.	86.	5.
32	76.	196.	6.
33	74.	205.	6.

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SEPARATION PROJECTIONS, 11TH MONTH

SEPARATION PROJECTIONS, 11TH MONTH

FILE   NONAME   (CREATION DATE = 07/15/82) • • • • • M U L T I P L E   R E G R E S S I O N • • • • • • • • • • • • • • • • • •

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	144.3939	50.1354	33
NOSPD	183.0788	71.9387	33
SPD	17.7273	12.1261	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	NOSPD
NOSPD	.04313	
SPD	.03025	-.36715

SEPARATION PROJECTIONS, 11TH MONTH

07/16/82   16.48.15.   PAGE   6

FILE   NONAME   (CREATION DATE = 07/15/82)

* * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * *

DEPENDENT VARIABLE..   ACCOMP   NOSPD.SPD

MEAN RESPONSE   144.39394   STD. DEV.   50.13540

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

MULTIPLE R	.83025	
R SQUARE	.68931	
ADJUSTED R SQUARE	.67929	
STD DEVIATION	28.39219	

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
REGRESSION	1.	55444.27639	55444.27639	68.77951	0
RESIDUAL	31.	24989.60240	806.11621		
COEFF OF VARIABILITY	19.7 PCT				

------------- VARIABLES IN THE EQUATION ------------- ---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	3.4329662	.41394247	.83072499 .42147	68.779590 0		NOSPD	.67113	.86520	24.586769 .000
(CONSTANT)	83.536812	8.8473189		89.152274 0					

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

MULTIPLE R	.91063	
R SQUARE	.82925	
ADJUSTED R SQUARE	.81787	
STD DEVIATION	21.39617	

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
REGRESSION	2.	66699.99987	33349.99994	72.84905	.000
RESIDUAL	30.	13733.87891	457.79596		
COEFF OF VARIABILITY	14.8 PCT				

------------- VARIABLES IN THE EQUATION ------------- ---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
SPD	4.0435097	.33536611	.97790076 .49642	145.37129 .000					
NOSPD	.28027950	.56525004E-01	.40721696 .35692	24.586769 .000					
(CONSTANT)	21.176085	14.234517		2.2131247 .147					

ALL VARIABLES ARE IN THE EQUATION.

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FILE NONAME (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..　　ACCOMP　　NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	4.0435097	.33536611	12.0579092	3.3586097 :	4.7284187
NOSPD	.28027958	.56575084E-01	4.9585047	.16484804 :	.39571896
CONSTANT	21.176085	14.214517	1.4876575	-7.8946767 :	50.246847

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.00320	
SPD	.00696	.11247
	NOSPD	SPD

FILE NONAME (CREATION DATE = 07/15/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..　　ACCOMP　　NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD	68.77951	0 .000	.83025	.68931	.68931	.83025	68.77951	0 .000
2	NOSPD	24.58677	.000	.91063	.82925	.13994	.04313	72.84905	

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

FILE NONAME   (CREATION DATE = 07/15/82)
********************   M U L T I P L E   R E G R E S S I O N   ********************

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL
1.	262.0000	266.1147	-4.114738
2.	208.0000	194.2135	13.78651
3.	149.0000	163.5823	-14.58234
4.	206.0000	223.1982	-17.19821
5.	170.0000	158.1396	11.86040
6.	152.0000	166.0249	-14.02485
7.	160.0000	187.3635	-27.36352
8.	164.0000	144.7273	19.27273
9.	147.0000	102.8382	35.43021
10.	156.0000	137.4404	18.55999
11.	256.0000	233.4904	22.50996
12.	212.0000	186.3657	25.63434
13.	168.0000	175.0796	-7.079632
14.	186.0000	193.0968	-7.096031
15.	125.0000	116.9048	8.095246
16.	148.0000	132.6014	15.39959
17.	119.0000	115.4240	3.575154
18.	100.0000	110.8293	-10.82929
19.	114.0000	112.3829	1.617142
20.	93.0000	82.91242	10.08758
21.	119.0000	118.4257	.5742513
22.	128.0000	126.9574	1.042608
23.	191.0000	141.8496	49.15037
24.	178.0000	150.3365	27.66347
25.	154.0000	118.7882	35.21108
26.	94.0000	130.9635	-36.96348
27.	99.0000	123.3548	-24.35484
28.	101.0000	98.33146	2.660542
29.	91.0000	107.8984	-16.89839
30.	84.0000	89.48211	-5.482111
31.	73.0000	65.49767	7.502329
32.	76.0000	100.3719	-24.37193
33.	74.0000	102.8944	-28.89444

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   33.   OR   3.03 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   1.   OR

VON NEUMANN RATIO   1.76546   DURBIN-WATSON TEST   1.71196

NUMBER OF POSITIVE RESIDUALS   18.
NUMBER OF NEGATIVE RESIDUALS   15.
NUMBER OF RUNS OF SIGNS   17.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.80293
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   .04865
PROBABILITY OF OBTAINING .GE. ABS(Z)   .40968

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VERSION 8.0 -- JUNE 18, 1979

87/18/82   16.56.17.   PAGE   1

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RUN NAME        SEPARATION PROJECTIONS, 12TH MONTH
VARIABLE LIST   ACCOMP,NOSPD,SPD
INPUT MEDIUM    DISK
N OF CASES      31
INPUT FORMAT    FREEFIELD
VAR LABELS      ACCOMP,NOSPD,SPD
LIST CASES      CASES=31/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION      METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
                REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/

STATISTICS      ALL
```

SEE54400 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 12TH MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	88.	27.
2	206.	196.	31.
3	170.	134.	24.
4	152.	98.	27.
5	168.	98.	27.
6	164.	118.	28.
7	147.	75.	31.
8	156.	104.	21.
9	256.	204.	25.
10	212.	177.	26.
11	168.	278.	13.
12	106.	313.	17.
13	125.	169.	18.
14	148.	223.	8.
15	119.	209.	7.
16	100.	245.	5.
17	114.	222.	8.
18	90.	88.	13.
19	115.	164.	4.
20	128.	279.	9.
21	191.	256.	12.
22	178.	247.	5.
23	154.	209.	2.
24	94.	340.	4.
25	99.	232.	#
26	101.	248.	6.
27	91.	214.	1.
28	84.	200.	4.
29	73.	99.	4.
30	76.	211.	3.
31	74.	224.	

SEPARATION PROJECTIONS, 12TH MONTH

SEPARATION PROJECTIONS, 12TH MONTH

FILE NONAME   (CREATION DATE = 07/15/82)

* * * * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	138.5484	45.2761	31
NOSPD	195.9677	75.1587	31
SPD	12.8387	9.8289	31

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	NOSPD
NOSPD	.85638	
SPD	.72213	-.49452

SEPARATION PROJECTIONS, 12TH MONTH

FILE NONAME (CREATION DATE = 07/15/82)
* * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   *
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

07/15/82.   15.50.17.   PAGE   6

MEAN RESPONSE   138.54839   STD. DEV.   45.27607

VARIABLE(S) ENTERED ON STEP NUMBER   1..   SPD

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.72213						
R SQUARE	.52148	REGRESSION	1.	32069.69905	32069.69905	31.60315	.000
ADJUSTED R SQUARE	.50498	RESIDUAL	29.	29428.07037	1014.76132		
STD DEVIATION	31.85532	COEFF OF VARIABILITY	23.0 PCT				

--------- VARIABLES IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY
SPD	3.3264659	.59172274	31.60315	.000	.7221334
(CONSTANT)	95.0404857	9.5104145	101.55528	.000	.30025

--------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
NOSPD	.60690	.78894	25.013305	.000

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   NOSPD

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.86444						
R SQUARE	.74726	REGRESSION	2.	45954.67905	22977.33873	41.39259	.000
ADJUSTED R SQUARE	.72921	RESIDUAL	28.	16543.09736	585.10741		
STD DEVIATION	23.56772	COEFF OF VARIABILITY	17.0 PCT				

--------- VARIABLES IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY
SPD	4.6701477	.50336123	82.42971	.000	.9921208
					.4235B
NOSPD	.32925711	.6583396E-01	25.013305	.000	.5465119
(CONSTANT)	15.349814	17.563953	.76376845	.390	.46571

--------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE

ALL VARIABLES ARE IN THE EQUATION.

* * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * *

FILE NONAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
SPD	4.5781477	.50336123	9.0792685	3.5399598	5.6012355
NOSPD	.32925711	.65833906E-01	5.0013304	.19448247	.46411176
CONSTANT	15.3409814	17.5603953	.87393847	-20.628313	51.327942

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.00433	
SPD	.01637	.25337
	NOSPD	SPD

* * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * *

FILE NONAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE..   ACCOMP   NOSPD,SPD

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		31.60318	.000	.72213	.52148	.52148	.72213	31.60318	.000
2	NOSPD		25.01331	.000	.86444	.74726	.22578	.05638	41.39259	.000

FILE NONAME (CREATION DATE = 07/15/82) *** MULTIPLE REGRESSION ***

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	149.0000	165.6044	-16.60437			
2.	206.0000	221.5588	-15.55079			
3.	170.0000	150.8732	19.12678			
4.	152.0000	168.3769	-16.37694			
5.	160.0000	171.8110	-11.81100			
6.	164.0000	145.6051	18.39489			
7.	147.0000	181.7107	-34.71068			
8.	156.0000	145.5657	10.43434			
9.	256.0000	226.4451	29.55490			
10.	212.0000	192.4522	19.54704			
11.	168.0000	166.2952	1.704788			
12.	186.0000	196.8998	-10.89988			
13.	125.0000	116.6957	8.304256			
14.	148.0000	176.9016	21.81030			
15.	119.0000	113.1923	5.807729			
16.	108.0000	118.8685	-10.86855			
17.	114.0000	125.0861	-11.00608			
18.	93.0000	84.88562	12.11438			
19.	119.0000	128.7599	-9.759901			
20.	128.0000	125.4931	2.506860			
21.	191.0000	148.7710	50.22904			
22.	178.0000	149.2133	28.78671			
23.	154.0000	107.0153	46.98471			
24.	94.0000	136.4375	-42.43753			
25.	99.0000	126.4809	-27.48091			
26.	101.0000	97.00558	3.994422			
27.	91.0000	113.2317	-22.23172			
28.	84.0000	85.77138	-1.771385			
29.	73.0000	66.22686	6.773141			
30.	76.0000	103.1637	-27.16366			
31.	74.0000	102.8139	-28.81386			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   31.   OR   3.23 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   1.

VON NEUMANN RATIO 1.72358   DURBIN-WATSON TEST   1.66798

NUMBER OF POSITIVE RESIDUALS   16.
NUMBER OF NEGATIVE RESIDUALS   15.
NUMBER OF RUNS OF SIGNS   17.

EXPECTED NUMBER OF RUNS OF SIGNS   16.
EXPECTED S.D. OF RUN DISTRIBUTION   2.73414
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   .37164
PROBABILITY OF OBTAINING .GE. ABS(Z)   .35508

APPENDIX D

Data Base Size Optimization

Statistics for Separation Regression Analysis

Table D-I

SEP1 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
37	1847.99	.99088	.99035	6.61	57.33	3554.36	2.51
36	1646.77	.99008	.98948	6.62	56.63	3001.58	2.56
35	1226.79	.98713	.98632	6.69	48.41	1814.47	2.51
34	1050.87	.98546	.98453	6.70	47.87	1717.34	2.49
33	861.92	.98289	.98175	6.77	39.45	1547.12	2.52
32	717.64	.98019	.97883	6.72	38.55	1314.44	2.52
31	652.13	.97898	.97748	6.79	37.79	1195.03	2.56
30	643.25	.97944	.97792	6.84	30.27	1155.88	2.41
29	648.70	.98035	.97884	6.54	34.70	1144.10	2.43
28	621.55	.98029	.97871	6.61	33.30	1088.83	2.43
27	601.91	.98045	.97882	6.70	31.84	1027.38	2.33
26	601.47	.98124	.97961	6.66	24.08	972.56	2.24
25	616.29	.98246	.98087	6.52	27.09	947.20	2.29
24	585.58	.98238	.98071	6.68	19.04	795.13	2.28
23	558.63	.98241	.98066	6.80	16.80	665.98	2.14
22	402.68	.97695	.97453	6.60	19.02	568.88	2.23
21	295.49	.97044	.96716	6.77	17.23	396.25	2.24
20	255.56	.96781	.96402	6.95	15.72	330.97	2.25
19	201.06	.96173	.95695	7.01	14.75	316.59	2.26
18	208.34	.96525	.96062	6.88	12.14	319.28	2.36
17	184.01	.96335	.95812	7.09	11.53	268.30	2.29
16	176.48	.96448	.95901	7.23	10.31	254.84	2.39
15	169.17	.96575	.96004	7.39	10.32	238.36	2.32
14	158.57	.96648	.96038	7.63	9.56	223.57	2.27
13	148.22	.96737	.96084	7.82	6.08	211.19	2.37
12	133.29	.96734	.96008	8.24	3.85	157.31	2.33

Table D-II

SEP2 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
36	1018.50	.98406	.98309	8.39	49.59	1844.89	2.37
35	796.34	.98030	.97907	8.27	50.70	1185.34	2.27
34	717.87	.97886	.97750	8.08	55.33	1178.80	2.37
33	582.22	.97488	.97321	8.21	38.71	1081.47	2.32
32	500.15	.97183	.96988	8.02	37.54	948.07	2.44
31	453.16	.97003	.96789	8.11	36.63	857.12	2.43
30	439.04	.97017	.96796	8.24	30.37	818.63	2.36
29	407.47	.96908	.96670	8.21	31.04	752.39	2.36
28	386.09	.96864	.96613	8.34	29.57	707.80	2.37
27	386.56	.96847	.96584	8.51	25.71	659.84	2.33
26	367.77	.96968	.96704	8.47	20.59	636.15	2.09
25	406.07	.97363	.97123	8.00	26.24	677.75	2.19
24	390.28	.97380	.97131	8.14	17.40	599.53	2.18
23	368.22	.97356	.97092	8.33	12.64	508.79	2.03
22	365.69	.97468	.97201	6.92	18.72	556.00	2.19
21	266.79	.96737	.96374	7.10	15.93	343.29	2.07
20	276.71	.97020	.96669	6.68	16.27	355.46	2.32
19	214.03	.96397	.95946	6.81	15.73	320.40	2.31
18	244.96	.97029	.96633	6.36	13.55	357.51	2.49
17	216.05	.96862	.96413	6.55	12.46	287.32	2.40
16	210.43	.97004	.96543	6.64	12.30	280.80	2.51
15	197.25	.97048	.96556	6.86	11.22	249.84	2.53
14	188.15	.97160	.96643	7.03	11.00	230.23	2.57
13	167.82	.97107	.96528	7.37	8.07	203.71	2.57
12	150.95	.97105	.96462	7.76	5.89	157.82	2.57
11	132.15	.97062	.96327	8.23	5.08	132.19	2.49

Table D-III

SEP3 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
35	649.05	.97594	.97444	9.14	46.95	971.86	2.21
34	558.40	.97299	.97125	9.13	46.22	929.97	2.13
33	482.32	.96984	.96783	8.99	33.00	888.90	2.23
32	396.04	.96468	.96224	8.98	30.86	748.11	2.28
31	354.58	.96202	.95930	9.13	29.77	669.83	2.24
30	354.44	.96331	.96059	9.13	23.81	660.66	2.09
29	339.86	.96316	.96032	8.96	25.83	622.12	2.13
28	321.37	.96256	.95956	9.11	24.28	581.51	2.14
27	308.70	.96258	.95946	9.27	19.73	541.83	2.14
26	304.22	.96358	.96041	9.28	16.63	519.76	1.91
25	324.55	.96722	.96424	8.92	20.04	540.25	2.03
24	308.83	.96712	.96399	9.12	14.76	478.68	2.01
23	294.30	.96714	.96385	9.29	10.42	416.47	1.99
22	210.82	.95688	.95234	9.03	10.50	311.51	2.03
21	155.28	.94522	.93913	9.21	7.84	191.15	1.90
20	207.98	.96074	.95612	7.67	12.23	273.91	2.64
19	188.66	.95932	.95424	7.23	16.81	295.86	3.18
18	182.35	.96050	.95523	7.33	13.70	276.26	3.26
17	160.11	.95811	.95213	7.58	11.92	228.62	3.27
16	148.20	.95798	.95152	7.86	11.07	211.57	3.27
15	136.84	.95800	.95099	8.18	9.93	193.53	3.26
14	125.62	.95805	.95043	8.54	9.13	177.69	3.27
13	112.59	.95748	.94897	8.93	6.59	161.08	3.27
12	101.09	.95738	.94791	9.41	4.48	126.96	3.22
11	93.39	.95893	.94866	9.73	4.08	117.64	3.20
10	53.09	.93816	.92049	9.99	2.56	86.86	2.87

Table D-IV

SEP4 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
34	375.84	.96039	.95784	11.06	32.67	673.45	2.13
33	372.11	.96125	.95867	10.29	24.08	713.84	2.42
32	301.98	.95418	.95102	10.22	22.87	584.79	2.44
31	270.42	.95078	.94726	10.40	21.99	528.39	2.44
30	263.39	.95124	.94763	10.53	18.34	511.23	2.27
29	269.68	.95401	.95047	10.01	22.00	515.12	2.47
28	254.46	.95318	.94943	10.19	21.16	479.86	2.47
27	244.04	.95313	.94923	10.37	17.24	450.06	2.45
26	247.88	.95566	.95181	10.24	14.11	446.90	2.28
25	260.06	.95942	.95573	9.93	16.60	460.38	2.36
24	249.01	.95954	.95569	10.12	11.72	418.42	2.36
23	237.15	.95954	.95549	10.31	7.78	365.84	2.38
22	155.12	.94229	.93622	10.44	7.25	240.62	2.41
21	112.43	.92588	.91765	10.71	5.55	143.31	2.27
20	135.41	.94093	.93398	9.41	6.26	179.00	2.85
19	102.27	.92745	.91838	9.65	5.57	162.77	2.90
18	96.56	.92792	.91831	9.91	4.39	148.49	2.83
17	89.26	.92728	.91689	9.98	4.95	127.57	2.95
16	83.66	.92791	.91681	10.30	4.72	119.15	2.99
15	77.63	.92825	.91629	10.69	4.36	110.55	3.00
14	71.32	.92840	.91538	11.15	4.03	101.38	3.00
13	63.60	.92712	.91254	11.69	2.60	89.91	2.99
12	58.58	.92866	.91280	12.18	1.55	77.60	3.05
11	52.17	.92879	.91098	12.81	1.34	68.97	3.04
10	27.69	.88779	.85573	13.46	.92	45.29	2.85

Table D-V

SEP5 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
33	264.35	.94630	.94272	12.00	15.98	515.78	2.82
32	212.91	.93624	.93184	12.06	15.25	416.90	2.86
31	190.48	.93154	.92665	12.26	14.45	374.70	2.79
30	195.20	.93531	.93052	12.13	11.81	382.40	2.63
29	190.52	.93612	.93121	11.80	12.90	371.00	2.75
28	179.29	.93482	.92961	12.02	11.89	345.45	2.75
27	171.96	.93477	.92933	12.24	9.58	325.93	2.69
26	180.07	.93997	.93475	11.92	7.24	335.15	2.63
25	176.47	.94133	.93599	11.93	7.96	322.39	2.66
24	171.14	.94219	.93669	12.10	5.13	300.97	2.65
23	170.88	.94471	.93918	12.05	2.44	281.11	2.67
22	112.19	.92194	.91372	12.15	2.16	185.70	2.71
21	80.48	.89942	.88825	12.48	1.85	111.07	2.56
20	87.21	.91119	.90074	11.54	1.44	122.33	2.94
19	64.74	.89002	.87628	11.89	1.26	105.15	2.94
18	60.81	.89020	.87556	12.23	1.00	96.83	2.92
17	53.42	.88414	.86759	12.60	1.05	80.17	2.95
16	50.08	.88512	.86744	13.00	1.05	74.66	2.98
15	46.21	.88509	.86594	13.53	.96	68.89	2.98
14	42.36	.88509	.86420	14.13	.87	62.93	2.96
13	39.52	.88768	.86522	14.52	.21	59.16	2.93
12	36.03	.88898	.86430	15.20	.07	50.74	2.93
11	32.63	.89080	.86350	15.86	.11	46.82	2.93
10	17.66	.83459	.78733	16.34	.08	28.59	2.64

Table D-VI

SEP6 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
33	247.96	.94296	.93916	12.37	20.04	486.89	2.06
32	197.85	.93172	.92701	12.48	19.18	388.68	2.03
31	178.57	.92731	.92211	12.64	19.01	352.26	2.05
30	184.38	.93178	.92672	12.45	15.83	362.28	1.84
29	180.59	.93285	.92768	12.09	16.07	355.29	1.94
28	170.82	.93181	.92636	12.29	15.67	333.33	1.95
27	163.00	.93143	.92571	12.55	13.47	314.01	1.95
26	154.08	.93055	.92451	12.82	11.94	291.47	1.91
25	150.33	.93182	.92562	12.87	12.66	278.64	1.86
24	151.73	.93528	.92911	12.80	8.00	272.19	1.85
23	154.17	.93909	.93300	12.65	4.29	261.13	1.82
22	100.59	.91371	.90463	12.77	3.97	169.97	1.84
21	71.94	.88880	.87645	13.12	3.39	102.29	1.84
20	61.71	.87893	.86469	13.47	3.18	88.43	1.71
19	78.25	.90724	.89565	10.92	7.97	129.76	2.53
18	74.82	.90889	.89674	11.14	6.42	120.76	2.50
17	65.60	.90358	.88981	11.50	6.12	103.36	2.51
16	60.75	.90334	.88847	11.93	5.66	95.47	2.51
15	56.60	.90416	.88818	12.36	5.25	88.98	2.47
14	53.23	.90635	.88933	12.76	5.12	83.25	2.35
13	54.16	.91548	.89857	12.59	1.71	85.43	2.07
12	50.07	.91753	.89921	13.10	1.82	73.49	1.68
11	71.86	.94727	.93409	11.02	3.35	108.38	2.26
10	40.05	.91963	.89667	11.39	3.37	67.23	2.44

Table D-VII

SEP7 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
32	109.96	.88350	.87546	16.30	17.60	215.13	1.65
31	104.14	.88149	.87303	16.13	19.22	204.97	1.70
30	100.73	.88182	.87306	16.39	18.29	197.41	1.71
29	88.49	.87191	.86206	16.70	17.59	173.22	1.67
28	88.03	.87566	.86571	16.60	16.64	170.85	1.74
27	85.80	.87730	.86707	16.79	13.51	164.26	1.74
26	84.51	.88022	.86980	16.83	10.74	158.30	1.70
25	79.60	.87858	.86754	17.17	10.26	145.32	1.58
24	86.96	.89227	.88201	16.52	5.39	152.76	1.66
23	106.39	.91409	.90549	15.02	1.48	175.74	1.70
22	66.99	.87580	.86273	15.33	1.44	115.99	1.63
21	50.91	.84978	.83308	15.25	2.14	76.74	1.72
20	43.69	.83715	.81799	15.62	2.08	65.38	1.66
19	33.79	.80858	.78465	15.69	2.59	57.10	1.78
18	41.24	.84614	.82562	14.48	1.13	68.39	1.75
17	35.97	.83708	.81381	14.94	1.12	58.73	1.76
16	33.30	.83668	.81155	15.50	1.03	54.28	1.72
15	31.84	.84145	.81503	15.90	.92	52.00	1.62
14	30.86	.84874	.82124	16.21	1.01	50.23	1.62
13	27.86	.84785	.81742	16.90	.40	45.97	1.55
12	27.81	.86075	.82981	17.02	.01	43.41	1.46
11	55.91	.93323	.91654	12.40	.01	90.49	2.09
10	29.19	.89292	.86233	13.15	.00	50.79	2.15

Table D-VIII

SEP8 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
31	80.46	.85179	.84121	18.04	24.07	159.29	1.95
30	78.25	.85287	.84197	18.29	23.25	154.39	1.95
29	69.04	.84154	.82935	18.58	22.69	136.09	1.96
28	67.45	.84365	.83115	18.62	21.77	131.95	2.02
27	71.77	.85675	.84481	18.14	19.28	139.16	2.05
26	67.89	.85514	.84255	18.51	17.66	129.09	2.06
25	63.54	.85244	.83902	18.93	16.03	117.72	2.02
24	64.25	.85954	.84616	18.86	10.42	114.45	2.06
23	89.75	.89975	.88973	16.97	4.15	150.51	2.21
22	55.47	.85378	.83839	16.62	3.85	97.54	2.20
21	39.64	.81496	.79440	16.93	4.01	62.90	2.13
20	34.94	.80433	.78130	17.12	3.96	56.16	2.22
19	25.11	.75835	.72814	17.63	3.72	43.86	2.24
18	24.48	.76550	.73424	17.88	2.77	41.80	2.23
17	21.35	.75313	.71786	18.40	2.60	36.33	2.23
16	20.03	.75504	.71735	18.99	2.47	34.03	2.26
15	18.57	.75581	.71511	19.73	2.24	31.50	2.26
14	17.65	.76243	.71924	20.32	2.22	29.90	2.23
13	16.35	.76575	.71891	20.96	.86	28.33	2.19
12	14.99	.76914	.71783	21.91	.41	24.86	1.98
11	33.43	.89289	.86611	15.71	1.05	57.62	2.57
10	19.88	.85029	.80752	15.54	.90	35.74	2.43

Table D-IX

SEP9 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
35	133.68	.89311	.88642	19.27	32.32	253.37	1.77
34	110.99	.87746	.86956	19.45	27.32	216.78	1.66
33	92.63	.86064	.85135	19.33	28.93	183.71	1.54
32	80.56	.84746	.83694	18.66	18.97	159.14	1.54
31	71.30	.83587	.82415	18.99	27.42	141.11	1.54
30	68.69	.83576	.82359	19.32	24.96	135.49	1.48
29	67.11	.83773	.82525	18.80	28.30	132.29	1.66
28	66.22	.84120	.82850	18.76	27.97	129.68	1.70
27	84.19	.87524	.86485	16.92	28.64	163.52	1.86
26	80.29	.87472	.86382	17.22	25.43	153.44	1.83
25	75.36	.87236	.86105	17.58	23.67	140.66	1.68
24	90.81	.89636	.88649	16.20	15.93	163.82	1.80
23	110.10	.91676	.90841	14.79	8.57	186.73	1.94
22	78.02	.89146	.88003	14.33	10.03	138.66	2.03
21	55.87	.86125	.84584	14.66	9.70	88.98	2.05
20	48.08	.84979	.83212	15.00	8.53	79.59	2.04
19	35.01	.81399	.79074	15.47	7.47	62.56	2.00
18	34.53	.82158	.79779	15.60	5.91	60.38	1.94
17	30.37	.81269	.78593	16.02	5.55	52.96	1.91
16	28.44	.81394	.78532	16.55	5.15	49.52	1.93
15	26.70	.81652	.78594	17.10	4.93	46.42	1.87
14	25.56	.82292	.79072	17.54	4.70	44.47	1.81
13	23.85	.82669	.79203	18.03	2.19	42.42	1.72
12	23.48	.83917	.80343	18.29	.92	40.22	1.69
11	28.92	.87850	.84813	16.73	1.47	50.53	2.16
10	14.37	.80411	.74814	17.78	1.32	25.56	2.28

Table D-X

SEP10 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
34	107.08	.87356	.86540	19.76	29.19	210.57	1.59
33	96.50	.86547	.85650	18.99	35.17	192.05	1.52
32	81.23	.84853	.83809	18.59	34.69	160.81	1.57
31	73.65	.84028	.82887	18.73	32.58	146.03	1.50
30	72.57	.84315	.83154	18.88	29.21	143.41	1.47
29	77.31	.85605	.84497	17.71	36.55	152.55	1.71
28	74.02	.85553	.84397	17.90	35.44	145.17	1.73
27	76.09	.86377	.85242	17.69	32.61	147.97	1.80
26	81.74	.87666	.86593	17.08	30.41	156.49	1.84
25	76.72	.87460	.86320	17.45	27.73	143.80	1.67
24	108.32	.91163	.90322	14.96	21.54	197.20	1.80
23	111.56	.91774	.90951	14.70	13.73	190.77	1.75
22	69.67	.88000	.86737	15.06	12.97	124.25	1.72
21	57.18	.86400	.84889	14.51	11.88	92.54	1.82
20	49.02	.85223	.83485	14.88	11.35	82.46	1.86
19	37.08	.82252	.80034	15.11	11.33	67.71	1.96
18	34.56	.82169	.79791	15.59	10.22	61.64	1.97
17	29.85	.81002	.78288	16.14	9.54	52.85	1.97
16	27.86	.81080	.78170	16.69	9.89	49.26	1.98
15	26.63	.81614	.78550	17.12	8.68	47.02	1.85
14	26.99	.83070	.79992	17.15	8.60	47.77	1.81
13	24.84	.83245	.79894	17.73	4.90	44.97	1.70
12	26.54	.85502	.82281	17.36	2.44	46.44	1.66
11	30.30	.88338	.85423	16.39	3.58	54.00	2.13
10	15.93	.81982	.76834	17.05	3.55	28.89	2.40

Table D-XI

SEP11 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
33	72.85	.82925	.81787	21.40	24.59	145.37	1.71
32	55.47	.79279	.77850	21.74	23.56	110.32	1.71
31	49.67	.78012	.76441	21.98	21.91	98.89	1.64
30	48.85	.78347	.76743	22.19	19.42	97.01	1.66
29	44.06	.77216	.75463	22.28	20.01	87.42	1.70
28	41.58	.76884	.75035	22.64	19.56	82.01	1.66
27	40.98	.77350	.75462	22.81	17.20	80.19	1.68
26	45.55	.79843	.78090	21.84	15.62	87.80	1.68
25	43.07	.79655	.77805	22.22	15.13	81.20	1.36
24	71.45	.87188	.85967	18.01	10.58	131.67	1.29
23	68.64	.87283	.86012	18.27	6.99	119.52	1.26
22	41.85	.81499	.79551	18.71	6.75	75.67	1.28
21	29.28	.76486	.73873	19.08	5.72	46.53	1.30
20	26.32	.75591	.72719	19.13	6.37	43.97	1.45
19	25.45	.76080	.73090	17.54	11.03	46.85	2.15
18	24.54	.76595	.73474	17.86	9.76	44.52	2.20
17	21.10	.75089	.71531	18.48	9.13	38.04	2.22
16	19.59	.75091	.71259	19.15	8.44	35.21	2.23
15	18.46	.75470	.71382	19.77	8.09	33.08	2.25
14	16.94	.75488	.71031	20.64	7.41	30.36	2.25
13	15.13	.75163	.70196	21.59	4.39	27.79	2.13
12	19.06	.80899	.76655	19.93	2.52	34.36	2.53
11	16.74	.80719	.75899	21.08	2.01	30.60	2.41
10	11.55	.76737	.70090	19.38	1.75	21.52	2.15

Table D-XII

SEP12 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R^2	ADJ R^2	$\sqrt{MSE}$	VAR. F STATS NOSPD	SPD	D-W
31	41.39	.74726	.72921	23.56	25.01	82.43	1.67
30	40.86	.75165	.73325	23.76	22.47	81.16	1.69
29	36.48	.73724	.71703	23.92	22.80	72.36	1.72
28	34.96	.73659	.71552	24.16	22.78	68.86	1.66
27	34.71	.74312	.72171	24.29	20.59	67.77	1.71
26	33.93	.74688	.72486	24.47	18.46	65.05	1.69
25	32.10	.74478	.72158	24.89	17.91	59.94	1.47
24	43.59	.80589	.78740	22.17	13.41	78.96	1.62
23	42.32	.80885	.78974	22.40	9.46	72.10	1.58
22	25.12	.72556	.69668	22.78	7.71	45.56	1.47
21	16.66	.64929	.61032	23.31	6.92	25.54	1.53
20	13.65	.61628	.57113	23.98	6.34	21.78	1.52
19	9.74	.54910	.49274	24.08	7.05	17.48	1.89
18	9.08	.54774	.48744	24.83	6.41	15.95	1.85
17	7.98	.53263	.46587	25.31	5.85	13.97	1.82
16	7.38	.53156	.45950	26.27	5.44	12.83	1.81
15	6.86	.53340	.45563	27.27	5.10	11.88	1.82
14	6.63	.54665	.46423	28.07	4.97	11.54	1.91
13	5.84	.53856	.44627	29.42	3.09	10.50	1.80
12	8.01	.64038	.56047	27.35	2.03	14.29	2.36
11	7.22	.64338	.55422	28.67	1.46	13.11	2.32
10	4.38	.55575	.42882	26.78	1.04	8.17	2.02
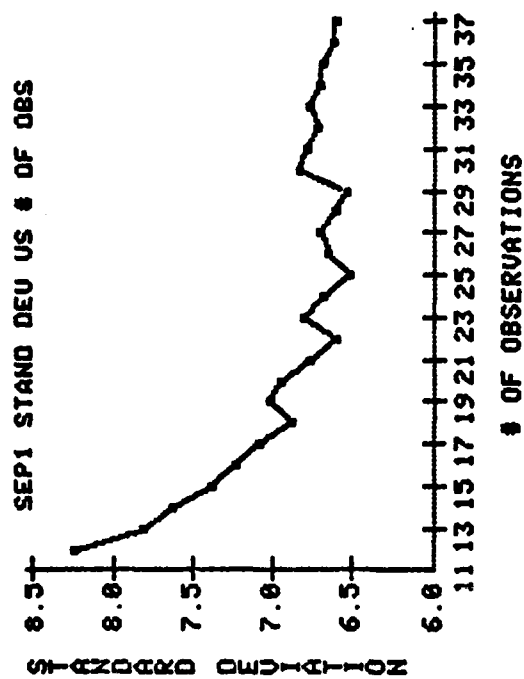
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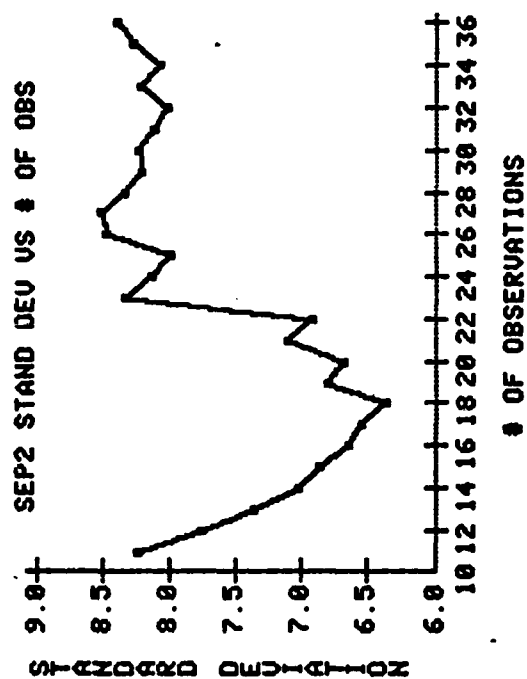
FIGURE D-3
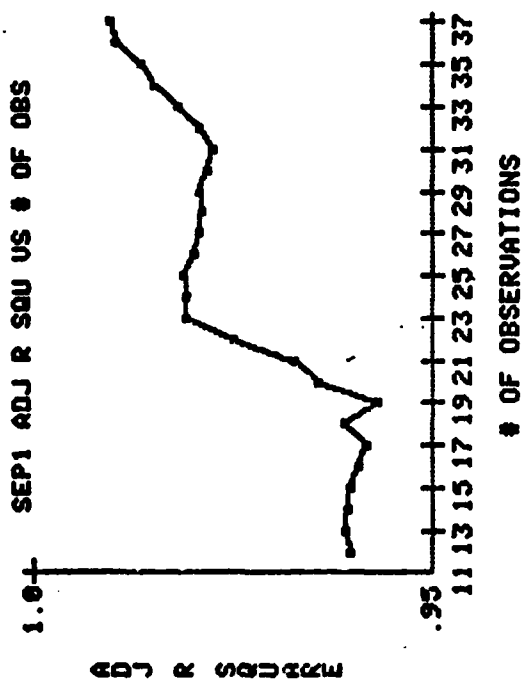
FIGURE D-2

FIGURE D-4

199
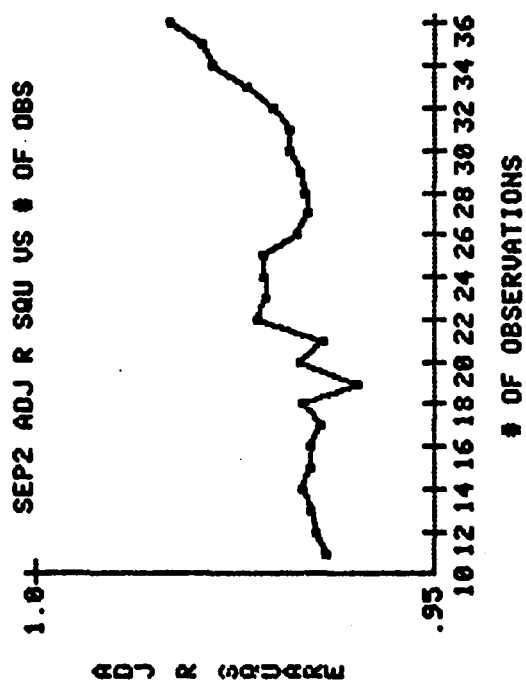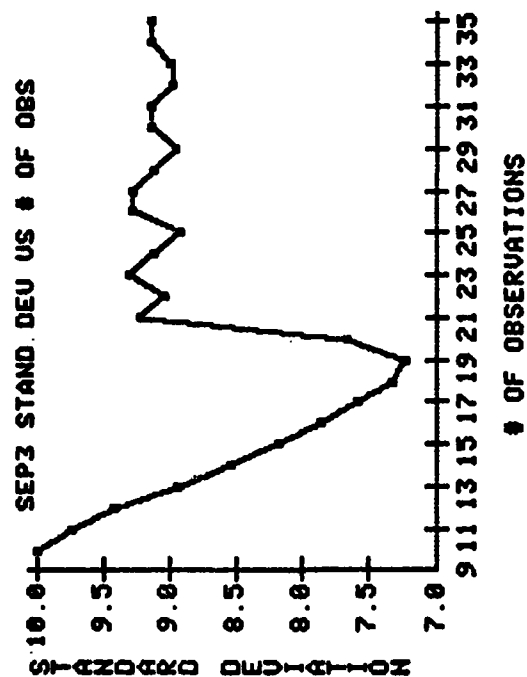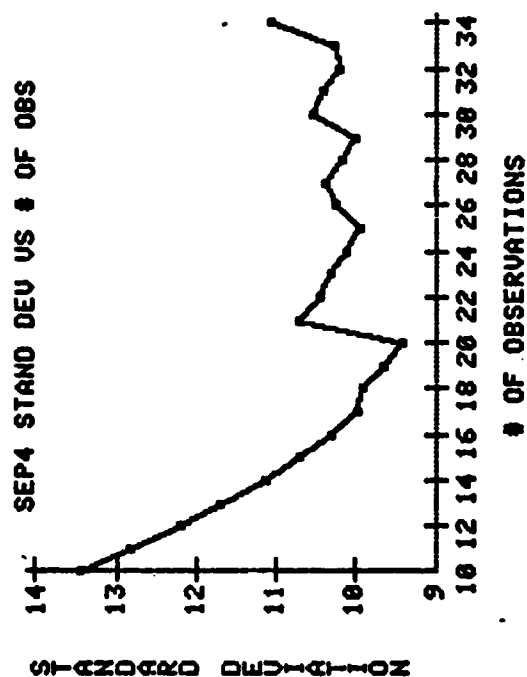
FIGURE D-5

FIGURE D-7

FIGURE D-6

FIGURE D-8

200

SEP5 STAND DEV VS # OF OBS

STANDARD DEVIATION

OF OBSERVATIONS

FIGURE D-9

SEP6 STAND DEV VS # OF OBS

STANDARD DEVIATION

OF OBSERVATIONS

FIGURE D-11

SEP5 ADJ R SQU VS # OF OBS

ADJ R SQUARED

OF OBSERVATIONS

FIGURE D-10

SEP6 ADJ R SQU VS # OF OBS

ADJ R SQUARED

OF OBSERVATIONS

FIGURE D-12

201
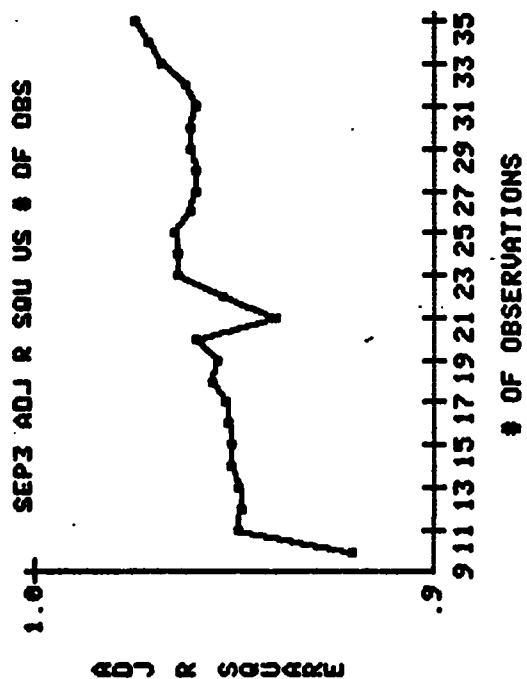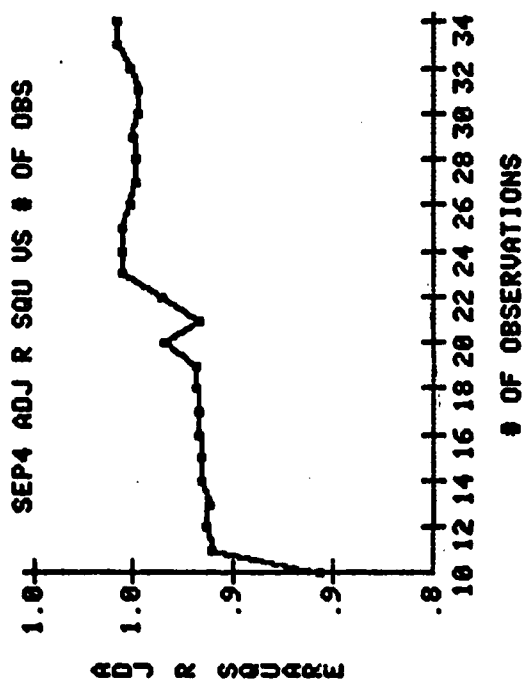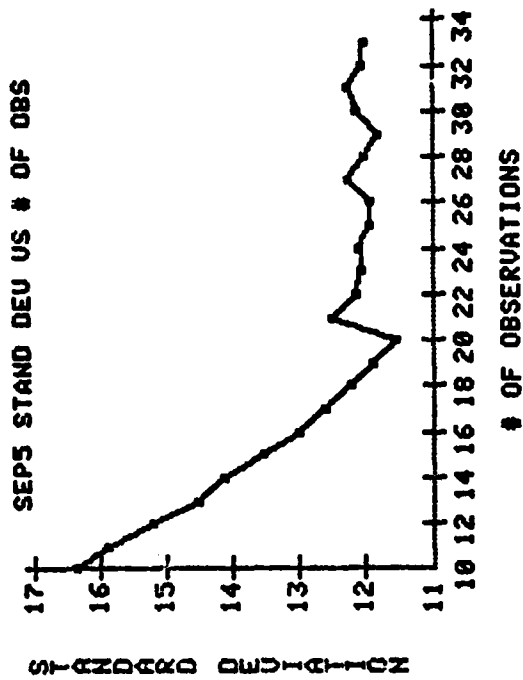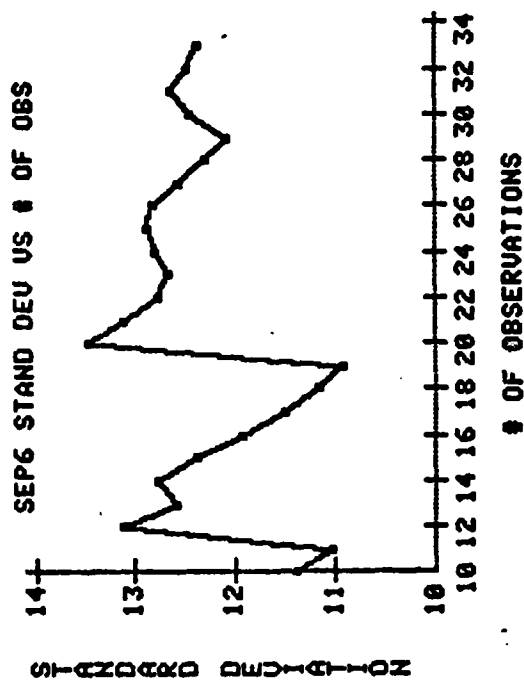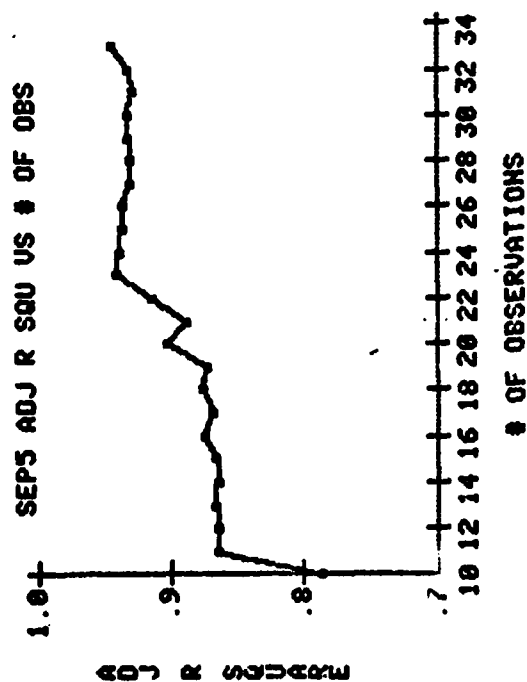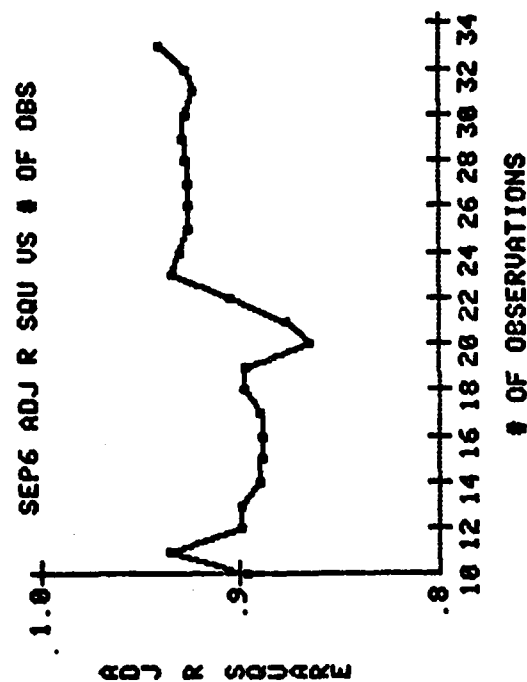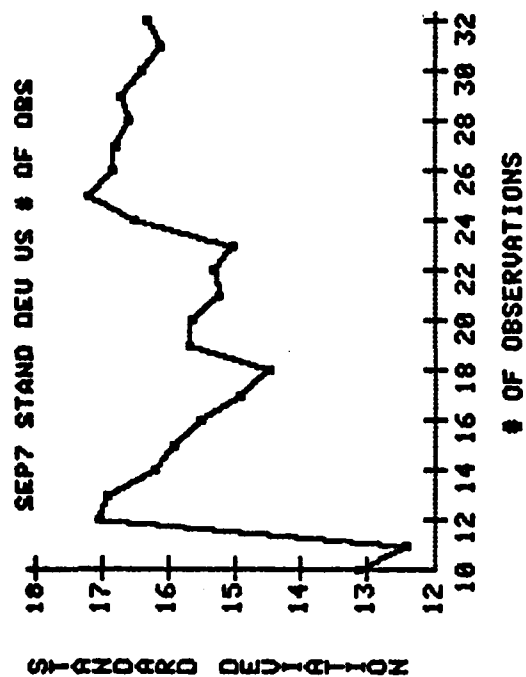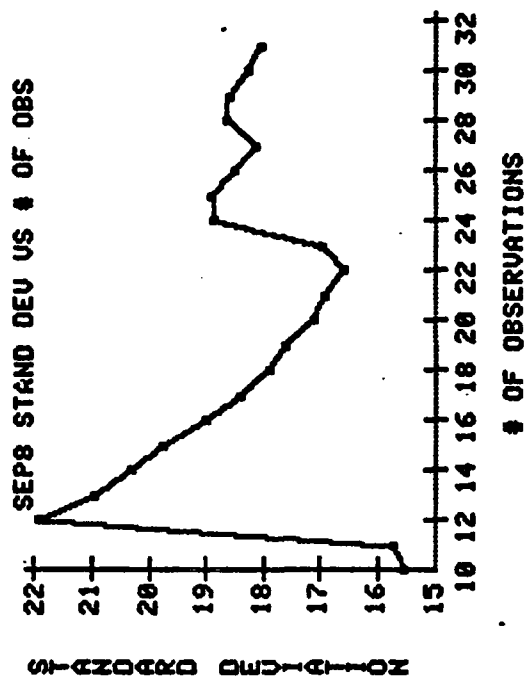
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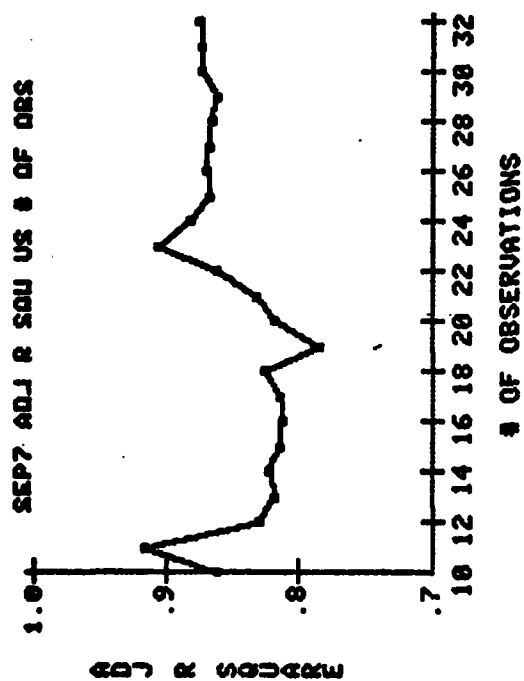
FIGURE D-15

FIGURE D-14
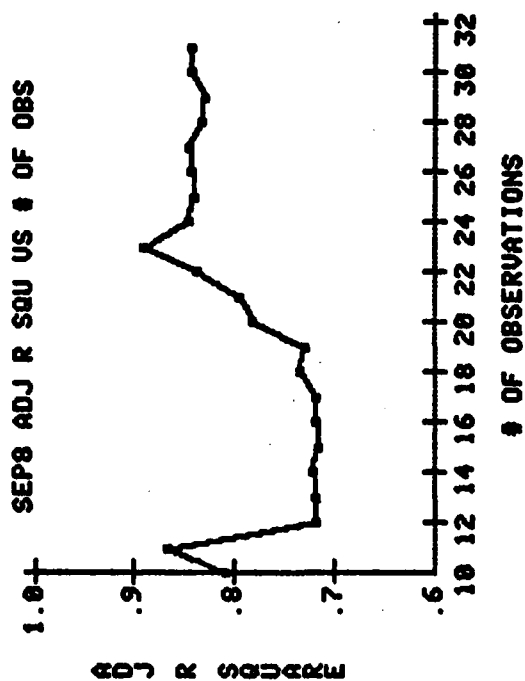
FIGURE D-16
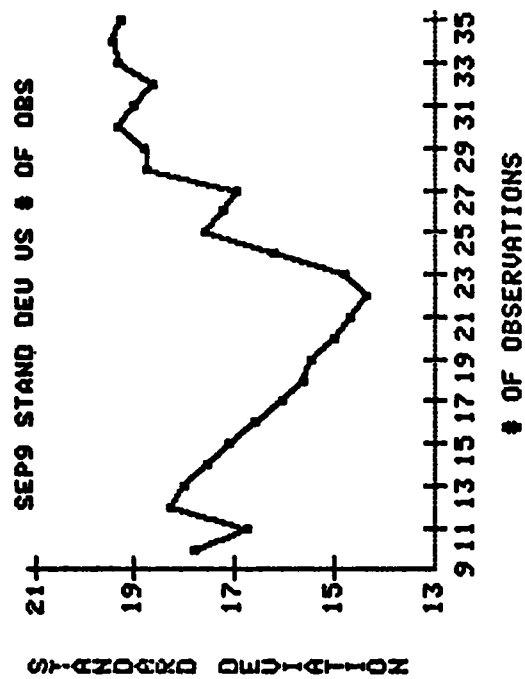
FIGURE D-17
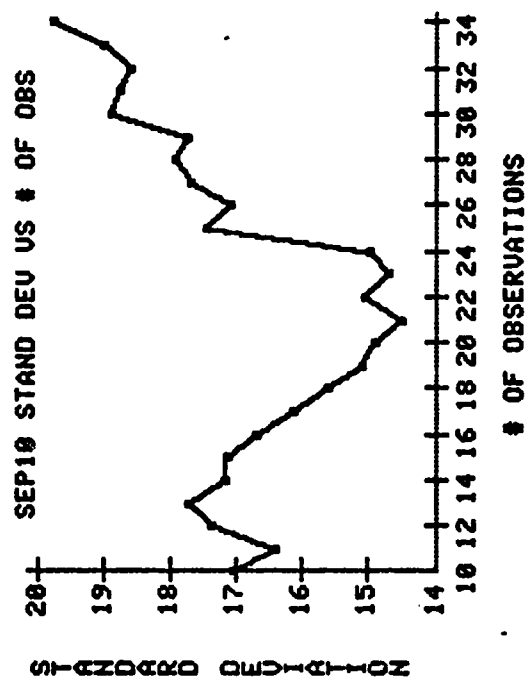
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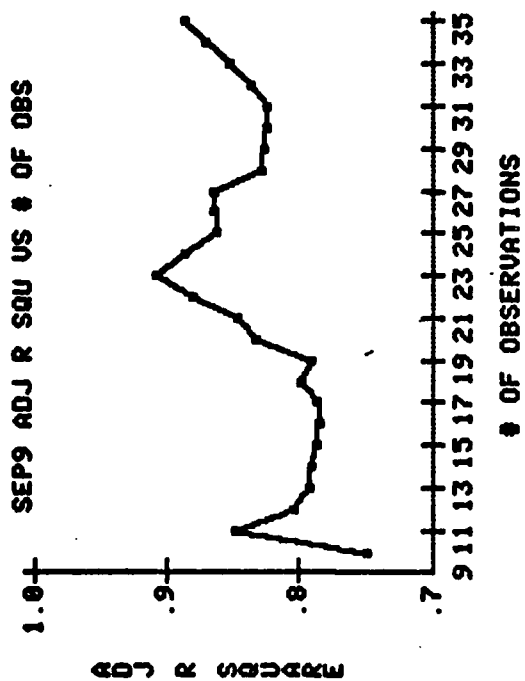
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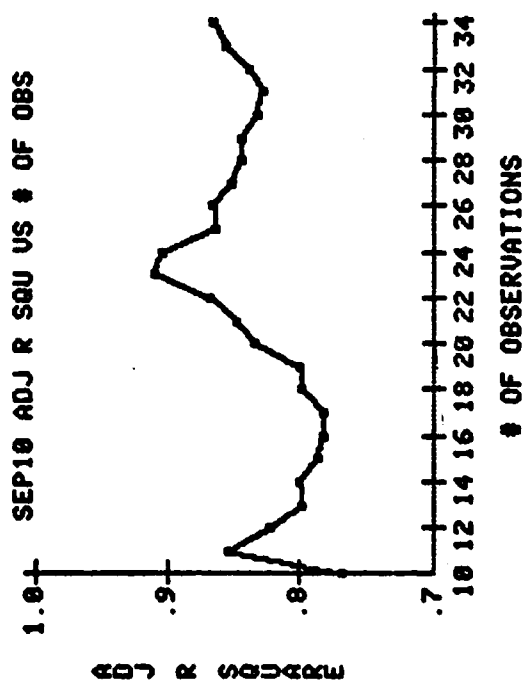
FIGURE D-20
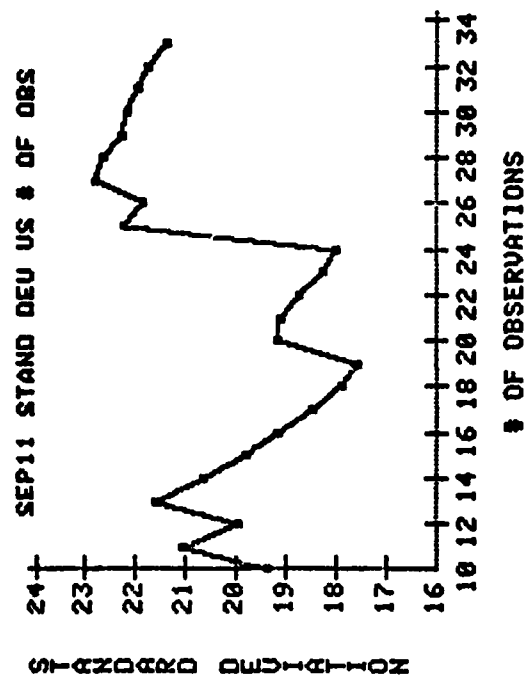
FIGURE D-21
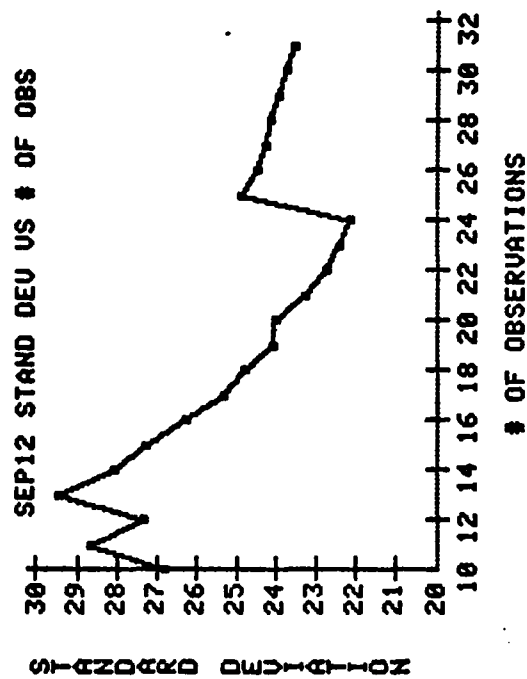
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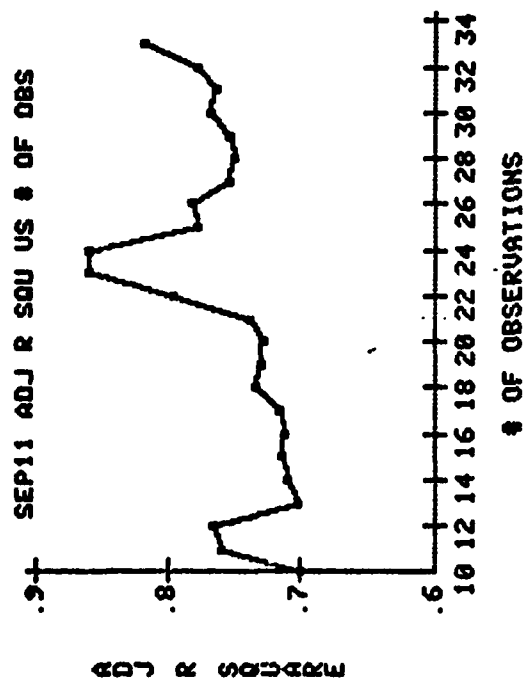
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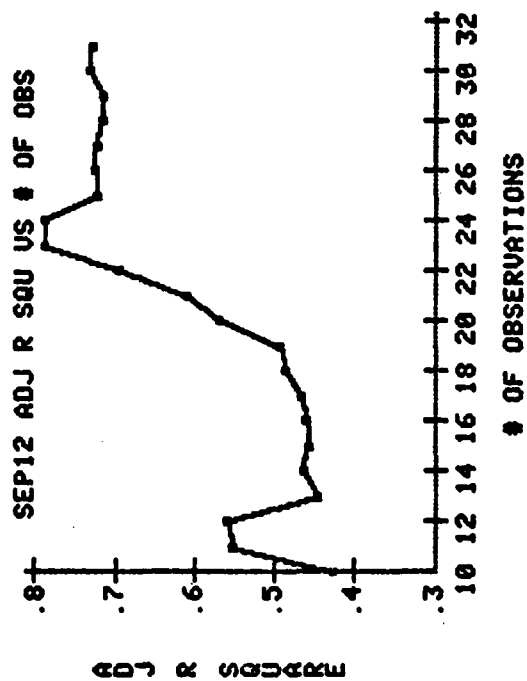
FIGURE D-24

APPENDIX E

Prediction Errors Associated with

Separation Regression Model

Table E-I

SEP1
# OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

# OF OBS	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	$\bar{X}$	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
					Error							
MAX	4	-3	-6	1	10	7	-15	1	-12	5	.8	8.2
25	6	-1	-1	3	12	8	-14	3	-12	5	.9	8.3
24	7	-1	-2	4	12	8	-14	3	-12	4	.9	8.4
23	7	-1	-1	4	12	9	-14	3	-12	5	1.2	8.5
22	7	-1	-1	4	11	8	-14	2	-12	5	.9	8.2
21	8	-1	-1	3	12	8	-14	1	-12	5	.9	8.4
20	8	-1	-2	4	14	-3	-17	1	-12	5	-.3	9.1

Table E-II

SEP2
# OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

# OF OBS	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	$\bar{X}$	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
					Error							
MAX	7	-2	1	2	10	6	-14	4	-7	-4	.3	7.2
25	10	0	2	5	13	8	-11	6	-7	-4	2.2	7.7
24	10	1	3	5	14	8	-11	6	-8	-3	2.5	7.9
23	11	1	3	5	14	8	-12	6	-7	-3	2.6	8.1
22	11	1	3	5	14	9	-12	6	-7	-4	2.6	8.2
21	11	2	3	5	13	7	-12	6	-6	-4	2.5	7.8
20	12	2	3	5	13	8	-12	1	-6	-3	2.3	7.8

Table E-III
SEP3
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS					Error						$\bar{X}$	S.D.
MAX	13	-1	1	8	13	7	2	8	-7	0	4.4	6.5
25	13	-2	1	9	14	10	3	10	-8	0	5.0	7.3
24	14	-1	2	9	13	10	3	10	-8	0	5.2	7.1
23	13	0	3	9	14	10	2	9	-8	0	5.2	6.9
22	14	1	3	10	14	10	2	9	-8	0	5.5	7.1
21	14	1	3	10	14	11	2	9	-8	0	5.6	7.1
20	13	1	3	10	13	10	2	9	-8	0	5.3	6.8
19	14	1	3	9	13	10	1	7	-8	0	5.0	6.8
18	14	1	3	9	13	11	-2	6	-7	1	4.9	6.9
17	14	2	3	9	13	10	-4	3	-6	2	4.6	6.8
16	13	1	2	9	11	10	-5	2	-6	2	3.9	6.6
15	13	0	3	7	10	8	-10	2	-6	2	2.9	7.1

Table E-IV
SEP4
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS					Error						$\bar{X}$	S.D.
MAX	23	1	1	9	13	-3	-5	15	-4	-4	4.6	9.8
25			1	9	15	2	-4	17	-5	-4	3.9	8.8
24		1	2	10	15	3	-2	17	-5	-4	4.1	8.1
23	23	2	3	10	15	3	-2	17	-5	-4	6.2	9.6
22	20	3	3	10	15	3	-2	16	-5	-4	5.9	8.9
21	20	3	3	11	16	3	-3	16	-5	-4	6.0	9.1
20	20	3	3	12	15	4	-3	16	-5	-4	6.1	9.1
19	20	3	3	12	15	3	-4	15	-5	-5	5.7	9.2
18	21	3	3	11	15	3	-4	14	-6	-4	5.6	9.3

Table E-V
SEP5
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	X̄	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS						Error					X̄	S.D.
MAX	32	2	-3	5	19	1	-6	11	5	-11	5.5	12.6
25					19	2	-4	13	4	-10	4.0	10.7
24				5	21	3	-4	13	4	-10	4.6	10.2
23			-3	6	21	4	-3	13	3	-10	3.9	9.8
22		2	-1	6	21	4	-3	12	2	-10	3.8	9.0
21	32	3	-1	6	21	4	-3	12	2	-10	6.6	12.2
20	32	3	-1	7	21	5	-4	12	1	-20	6.6	12.4
19	32	2	-1	6	21	6	-5	12	-1	-10	6.2	12.6
18	30	3	-1	6	21	5	-5	11	-2	-10	5.8	12.1

Table E-VI
SEP6
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	X̄	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS						Error					X̄	S.D.
MAX	17	11	-14	6	13	10	9	11	4	-5	6.2	9.3
25						10	11	12	3	-5	6.2	7.2
24					13	12	10	11	3	-5	7.3	7.0
23				6	15	12	10	12	3	-5	7.6	6.8
22			-14	7	15	12	10	12	3	-5	5.0	9.9
21		11	-12	7	15	13	10	12	2	-5	5.9	9.1
20	17	13	-12	7	15	13	10	12	3	-5	7.3	9.4
19	19	13	-13	7	15	13	10	12	1	-6	7.1	10.1
18	19	11	-13	7	15	12	10	11	-2	-4	6.6	9.9

Table E-VII

SEP7
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

# OF OBS	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	$\bar{X}$	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
						Error						
MAX	38	25	-1	9	9	-7	30	26	10	-6	13.3	15.7
23						-7	29	24	11	-7	10.0	16.9
22					9	-10	28	24	10	-7	9.0	15.5
21				9	7	-11	29	23	10	-7	8.6	14.5
20			-1	7	6	-11	27	22	9	-6	6.5	13.2
19		25	-3	7	7	-12	27	22	9	-6	8.4	14.0
18	38	24	-3	7	6	-12	26	22	7	-5	11.0	15.9

MEAN AND STANDARD DEVIATION
FOR
FEBRUARY THROUGH JULY

# of Obs	$\bar{X}$	S.D.
MAX	10.3	15.5
22	9.0	15.5
21	8.5	15.9
20	7.7	15.2
19	7.8	15.2
18	7.3	14.8

Table E-VIII

SEP8
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	$\bar{X}$	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS						Error					$\bar{X}$	S.D.
MAX	47	38	-4	16	13	-9	28	31	26	-18	20.3	17.5
21						-9	28	31	26	-20	11.2	23.9
20					13	-11	27	30	30	-20	10.5	21.1
19				16	12	-11	27	28	24	-16	11.4	18.0
18			-4	15	12	-12	25	28	25	-19	8.8	18.2

MEAN AND STANDARD DEVIATION
FOR
MARCH THROUGH JULY

# of Obs	$\bar{X}$	S.D.
MAX	11.4	23.0
21	11.2	23.9
20	10.0	23.6
19	10.4	21.9
18	9.4	22.9

Table E-IV

SEP9
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION−ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	$\bar{X}$	S.D.
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS						Error					$\bar{X}$	S.D.
MAX	60	41	5	11	22	−11	29	29	45	−11	22.0	23.6
24						−11	29	26	45	−11	15.6	25.3
23					22	−9	26	30	45	−10	17.3	22.2
22				11	22	−14	30	30	44	−13	15.7	22.3
21			5	12	20	−9	30	30	46	−14	18.5	17.0
20		41	5	9	23	−8	30	26	46	−16	17.3	21.3
19	60	41	1	12	23	−9	26	25	44	−16	20.7	24.1
18	59	39	6	12	23	−14	26	21	44	−16	20.0	24.1
17	57	42	6	12	20	−15	22	21	44	−15	19.4	23.9
16	62	42	6	9	19	−17	22	21	40	−15	18.9	24.8

MEAN AND STANDARD DEVIATION
FOR
MARCH THROUGH JULY

# of Obs	$\bar{X}$	S.D.
MAX	16.2	25.7
24	15.6	25.3
23	16.4	24.7
22	15.4	27.0
21	16.6	26.5
20	15.6	26.4
19	14.0	25.5
18	12.2	26.3
17	11.4	25.8
16	10.2	25.1

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APPENDIX F

Separation's Time Series Analysis

Computer Output (Undifferenced Data)

LAG	AUTOCOVARIANCE	AUTOCORRELATION	PARTIAL AUTOCORRELATION
1	.013404	.815772	.815772
2	.010789	.656822	-.026537
3	.007625	.464098	-.192628
4	.004296	.261439%	-.174901
5	.002367	.144051	.112830
6	.001751	.106583	.187923
7	.002244	.136568	.152823
8	.002797	.170243	-.054404
9	.004651	.283117%	.224728
10	.006222	.378692%	.141829
11	.007251	.441382%	.060499
12	.007716	.469637%	-.018108
13	.006105	.371599%	-.274068
14	.003627	.220745	-.179822
15	.000701	.042640	-.081068
16	-.001810	-.110191	-.020665
17	-.003586	-.218254	-.061428
18	-.004010	-.244074	-.028218
19	-.004082	-.248494%	-.189051
20	-.003832	-.233219	-.127097
21	-.002153	-.131040	-.174243
22	-.001000	-.061406	-.027960
23	.000165	.010057	.013760
24	.000331	.020152	-.169776
25	-.000545	-.033150	-.072817
26	-.001962	-.119418	.156658
27	-.004073	-.247903%	.013990
28	-.005468	-.332364%	-.042056
29	-.006651	-.404803%	-.124754
30	-.006336	-.385678%	.096090
31	-.006575	-.400229%	-.145269
32	-.006298	-.383168%	-.096282
33	-.005246	-.319339%	-.054732

THE APPROXIMATED 2 S.E. BAND IS +/-   .2443

%=DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

			INTNCTY
I	FG	P	
1	.015	67.000	.589
2	.030	33.500	.008
3	.045	22.333	.031
4	.060	16.750	.023
5	.075	13.400	.128
6	.090	11.167	.157
7	.104	9.571	.036
8	.119	8.375	.002
9	.134	7.444	.011
10	.149	6.700	.038
11	.164	6.091	.000
12	.179	5.583	.000
13	.194	5.154	.001
14	.209	4.786	.000
15	.224	4.467	.005
16	.239	4.188	.001
17	.254	3.941	.001
18	.269	3.722	.008
19	.284	3.526	.007
20	.299	3.350	.003
21	.313	3.190	.012
22	.328	3.045	.012
23	.343	2.913	.003
24	.358	2.792	.002
25	.373	2.680	.006
26	.388	2.577	.000
27	.403	2.481	.007
28	.418	2.393	.002
29	.433	2.310	.011
30	.448	2.233	.001
31	.463	2.161	.004
32	.478	2.094	.001
33	.493	2.030	.001

(F(N) = ACF(N))

R-ARRAY

$$(F(N) = ((-1)**N)) \cdot ACF(N))$$

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	-.0426	-.1248	.0140	-.0409	-.0338	-.0071	-.0071	.0385	-.5084	-.0137
(-14)	.2207	-.0581	.0331	.0124	-.0699	-.0115	-.0335	-.0439	-.0728	-.0303
(-13)	-.3716	-.0672	.0122	.0361	-.0293	-.0236	-.0773	-.1047	.1482	.0320
(-12)	.4696	.0186	.0028	.0216	-.0946	-.0642	-.1352	-.3757	.7472	.0100
(-11)	-.4414	-.0225	-.0227	.0496	.0796	.0516	.1121	.1359	-.0823	-.0087
(-10)	.3787	.0237	-.2028	.0026	.0713	-.0303	.0944	.0951	.5255	.0489
(-9)	-.2831	.0214	-.0365	-.0813	.0333	.6123	.0513	-.1207	.2115	.1154x
(-8)	.1702	-.0016	-.0384	-.0226	-.0427	-.1053	.0647	.0802	-.1488x	-.0164
(-7)	-.1366	-.0342	.0123	.0274	.2891	-.0292	.0768	-.1573x	-.0334	-.0023
(-6)	.1066	-.0284	.6689	.0220	.0727	-.1051	-.1857x	.0086	-.0544	-.0028
(-5)	-.1441	-.0038	-.0547	-.0811	-.2430	.1563x	.0284	.0461	.1434	.0163
(-4)	.2615	.0602	.0193	-.0933	.1762x	-.0294	-.0168	-.0669	-.0257	-.0154
(-3)	-.4641	.0469	.1610	-.0374	-.0199	.0104	-.0214	.0224	.3649	-.0077
(-2)	.6567	-.0061	.1792x	-.0275	-.0973	-.0092	-.0308	-.0303	-.0000	-.0051
(-1)	-.8159	-.1841x	.0344	.0112	-.0155	-.0653	-.0379	-.5601	-.0331	-.0000
(0)	1.0000x	.0049	.0271	.0167	.0344	.1693	.0394	.0399	.1905	-.0000
(1)	-.8159	.0357	-.0210	.0123	-.0698	.0482	.1631	.0303	-.0000	.0000
(2)	.6567	.0398	.0166	.0225	-.0170	.0544	.0305	.0034	-.0000	.0000
(3)	-.4641	.0021	.0253	-.0024	-.1148	.0278	.0039	.0000	.0000	.0000
(4)	.2615	.0176	-.0191	.1185	.1219	-.0091	-.0035	.0000	.0000	.0000
(5)	-.1441	.0332	-.0331	-.0580	.0103	.0103	.0000	.0000	.0000	.0000
(6)	.1066	.0021	.0313	-.0222	-.0323	.0086	.0000	.0000	.0000	.0000
(7)	-.1366	-.0316	.6035	-.0201	.0899	.0000	.0000	.0000	.0000	.0000
(8)	.1702	-.0346	-.0030	-.0566	.0441	.0000	.0000	.0000	.0000	.0000
(9)	-.2831	-.0279	.0246	.0031	.0000	.0000	.0000	.0000	.0000	.0000
(10)	.3787	-.0207	.9397	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(11)	-.4414	.0621	.0108	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(12)	.4696	.0409	.0064	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	-.3718	-.0555	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	.2207	-.0993	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	-.0426	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)	-.1162	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-5.1709	3.9328	6.0281	8.0395	-3.6613	8.6641	51.9277	-1.0679	-12.0200
(-14)	1.0000	-8.6834	4.8827	-1.5638	-3.4788	-3.8774	13.9145	-7.7116	11.3095	-10.4856
(-13)	1.0000	-2.8638	8.4774	-3.1679	6.6078	-4.5617	-5.9059	-3.3385	3.4528	-12.6326
(-12)	1.0000	-1.9398	4.1014	-38.5382	-8.0404	-3.4255	1.2148	-.7527	8.0907	-12.0917
(-11)	1.0000	-1.8580	3.5892	-1.5768	1.8595	-6.1851	4.4611	-3.2755	13.5880	-13.5568
(-10)	1.0000	-1.7476	.1584	-1.9623	58.8845	-10.6591	20.7003	-7.9024	1.8354	-13.7819
(-9)	1.0000	-1.6013	1.6631	-1.8226	7.2638	-.9750	17.5105	6.8321	9.8268	-10.5965x
(-8)	1.0000	-1.8022	1.1483	-5.6838	-3.4440	-14.9419	26.0424	-5.9035	36.7393x	-2.3813x
(-7)	1.0000	-1.7804	4.3054	-16.1385	1.9246	-20.3819	-31.6338	-12.0666x	-1.9444x	-3.5465
(-6)	1.0000	-2.3515	2.4432	-9.7126	27.2308	-12.1880	-8.5120x	-1.8441x	-5.6503	-3.6991
(-5)	1.0000	-2.8152	47.2696	-5.8097	2.8069	-17.4593x	1.5996x	-1.2879	1.0178	-3.7706
(-4)	1.0000	-2.7748	4.2974	18.6509	10.1204x	-1.9698x	3.1449	2.2559	3.1983	-6.1694
(-3)	1.0000	-2.4150	2.5337	-7.8458x	1.7701x	-4.3566	8.1891	-4.8064	-.4666	-6.4305
(-2)	1.0000	-2.2424	69.4802x	-1.5066x	.8280	-1.7799	-10.8546	-1.3171	.7367	-5.8847
(-1)	1.0000	-2.2257x	1.8646x	-3.1423	3.7566	-1.5923	-5.7239	-.2644	5.3755	-4.9753
(0)	1.0000x	-1.8159x	14.8483	-6.3296	-.4639	5.4543	-7.0065	-1.0260	.0000	.0000
(1)	1.0000x	-1.8049	3.5692	-2.9551	1.5507	-9.9626	-1.2815	-3.0399	.0000	.0000
(2)	1.0000	-1.7067	1.6476	-5.9238	-7.2166	-5.2431	2.5610	-6.0568	.0000	.0000
(3)	1.0000	-1.5634	-11.4270	8.8171	1.7374	-4.0464	5.3679	-.7881	.0000	.0000
(4)	1.0000	-1.5569	5.0270	1.5697	-84.8846	-3.6081	7.6707	.0000	.0000	.0000
(5)	1.0000	-1.7399	2.1383	1.6836	2.6649	-4.7544	5.8496	.0000	.0000	.0000
(6)	1.0000	-2.2813	-31.8408	-4.6920	5.8643	-4.7208	.0000	.0000	.0000	.0000
(7)	1.0000	-2.2466	-.2567	-4.2412	-2.6649	.0000	.0000	.0000	.0000	.0000
(8)	1.0000x	-2.6630	4.2206	27.6285	9.2756	.0000	.0000	.0000	.0000	.0000
(9)	1.0000	-2.3376	3.7734	5.0860	2.0454	.0000	.0000	.0000	.0000	.0000
(10)	1.0000	-2.1655	8.2546	-2.1634	.0000	.0000	.0000	.0000	.0000	.0000
(11)	1.0000	-2.0640	2.9720	-1.5452	.0000	.0000	.0000	.0000	.0000	.0000
(12)	1.0000	-1.7918	3.7578	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	1.0000	-1.5940	3.3265	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	1.0000	-1.1932	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	1.0000	1.5842	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

APPENDIX G

Separation's Time Series Analysis

Computer Output (Nonseasonally Differenced Data)

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y

LAG	AUTOCOVARIANCE	AUTOCORRELATION	PARTIAL AUTOCORRELATION
1	-.000456	-.078739	-.078739
2	.000373	.064272	.058434
3	.000238	.041027	.050881
4	-.001364	-.235331	-.235017
5	-.000934	-.161207	-.214621
6	.001085	.187235	.212347
7	.000041	.007082	.004808
8	-.001504	-.259394*	-.321268
9	.000227	.039080	.157246
10	.000479	.062580	.084686
11	.000762	.131500	.075166
12	.002063	.355851*	.261642
13	.000650	.112200	.125127
14	.000558	.096309	.061283
15	.000474	.081851	.010536
16	-.000584	-.100730	-.043204
17	-.001121	-.193480	-.025549
18	.000296	.051149	.120375
19	-.000175	-.030166	.109067
20	-.001551	-.267614*	-.163314
21	.000691	.119180	.012854
22	-.000350	-.060308	-.118777
23	.001134	.195653	.079973
24	.001327	.228897	.067832
25	.000078	.013525	-.173788
26	.000827	.142714	.012182
27	-.000753	-.129863	.027117
28	.000013	.002273	.058423
29	-.001369	-.236137	-.144090
30	.000391	.067385	.069266
31	-.000398	-.068680	.032900
32	.001026	.177017	.001356
33	-.000088	-.015114	-.208536

THE APPROXIMATED 2 S.E. BAND IS +/- .2443

*-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
0 - DEFAULT OF 45; N .LT. LW/2 ->33

I	FQ	P	INTNSTY
1	.015	66.000	.006
2	.030	33.000	.000
3	.045	22.000	.003
4	.061	16.500	.004
5	.076	13.200	.039
6	.091	11.000	.036
7	.106	9.429	.013
8	.121	8.250	.002
9	.136	7.333	.006
10	.152	6.600	.001
11	.167	6.000	.039
12	.182	5.500	.003
13	.197	5.077	.001
14	.212	4.714	.001
15	.227	4.400	.007
16	.242	4.125	.001
17	.258	3.882	.005
18	.273	3.667	.013
19	.288	3.474	.009
20	.303	3.300	.016
21	.318	3.143	.013
22	.333	3.000	.039
23	.348	2.870	.003
24	.364	2.750	.004
25	.379	2.640	.015
26	.394	2.538	.016
27	.409	2.444	.003
28	.424	2.357	.048
29	.439	2.276	.011
30	.455	2.200	.000
31	.470	2.129	.017
32	.485	2.063	.002
33	.500	2.000	.016

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)										
(-14)										
(-13)										
(-12)										
(-11)										
(-10)										
(-9)										
(-8)										
(-7)										
(-6)										
(-5)										
(-4)										
(-3)										
(-2)										
(-1)										
(0)										
(1)										
(2)										
(3)										
(4)										
(5)										
(6)										
(7)										
(8)										
(9)										
(10)										
(11)										
(12)										
(13)										
(14)										
(15)										
(16)										

S-ARRAY

(A,I)

(F(N) = ((-1)XXN)XACF(N))

R-ARRAY

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-.1765	1.9407	1.3158	1.7145	-1.6360	10.3916	10.9065	4.6054	-9.0222
(-14)	1.0000	-.1658	-5.4170	-1.8177	1.3588	11.3562	23.1662	.6788	4.9728	-3.9642
(-13)	1.0000	-4.1716	1.8273	-122.5534	1.4211	-7.9560	1.2556	-9.9398	4.4762	-11.2943
(-12)	1.0000	-1.3696	1.1130	-11.8787	1.9782	.6034	1.0784	-1.6887	4.9859	-11.2643
(-11)	1.0000	-1.6200	36.8739	2.0536	.7847	-.5276	-.1164	-1.8379	4.7407	-5.5834
(-10)	1.0000	-1.4732	3.4528	-.9117	-5.2276	-1.4653	1.7363	6.5932	5.8719	-169.3413
(-9)	1.0000	5.6375	.3577	-1.0361	2.0307	-11.5807	3.6381	.6920	5.8627	7.6271%
(-8)	1.0000	-.9727	1.1431	-9.2533	1.0249	-4.9822	-8.3595	-4.0738	4.4297%	-1.1993%
(-7)	1.0000	85.4378	1.3806	.8574	3.4064	-6.6377	-4.8519	-823.9969%	1.4231%	-1.9468
(-6)	1.0000	-1.8610	-4.9539	-1.6298	6.7654	-270.5975	6.0480%	-1.0771%	1.8959	37.5622
(-5)	1.0000	-2.4598	1.2825	17.4434	8.5618	-4.1197%	1.0719%	70.5399	1.8794	-4.0700
(-4)	1.0000	-.8257	.4924	9.6370	4.7903%	-.8842%	1.0528	-.2875	1.9413	.8862
(-3)	1.0000	-2.5664	-13.1497	-17.9155%	1.1258%	-1.9467	-1.7280	-1.6579	2.3532	-1.1158
(-2)	1.0000	-.2751	-14.1445%	-.9116%	1.9123	57.6635	3.7600	.7586	2.5207	-1.9310
(-1)	1.0000	11.7002%	.8674%	3.0846	1.8974	3.1001	.7431	-1.4858	2.1179	-4.7178
0	1.0000	-.9213%	1.6669	-4.6002	1.1095	1.3892	-.0419	-1.5698	2.1647	-2.9310
1	1.0000	-.1837	1.1244	-6.7783	-.9806	4.2131	1.5882	2.3750	2.1647	.0000
2	1.0000	-1.6383	4.7303	-.5787	-1.2662	.5697	1.3995	-1.8111	.0000	.0000
3	1.0000	-4.7360	1.4443	1.8048	1.6257	.8121	2.0196	-7.8491	.0000	.0000
4	1.0000	-1.6850	-2.7649	-1.5035	-6.2213	-2.0722	5.6574	.0000	.0000	.0000
5	1.0000	-2.1615	-1.5321	-1.9461	1.8678	-1.3260	6.8660	.0000	.0000	.0000
6	1.0000	-.9622	-.4941	-1.0070	1.5570	-11.8398	.0000	.0000	.0000	.0000
7	1.0000	35.6268	1.1825	-3.8068	1.4919	-6.1538	.0000	.0000	.0000	.0000
8	1.0000	-.8493	2.7003	11.4575	1.8744	.0000	.0000	.0000	.0000	.0000
9	1.0000	-3.1131	-8.0102	132.1080	.7927	.0000	.0000	.0000	.0000	.0000
10	1.0000	-2.5524	-11.3535	-.5432	.0000	.0000	.0000	.0000	.0000	.0000
11	1.0000	-3.7061	-.0499	-1.0622	.0000	.0000	.0000	.0000	.0000	.0000
12	1.0000	-1.3153	-1.6930	.0000	.0000	.0000	.0000	.0000	.0000	.0000
13	1.0000	-1.8584	2.0737	.0000	.0000	.0000	.0000	.0000	.0000	.0000
14	1.0000	-.1501	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
15	1.0000	-2.2307	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
16	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

(4,1)

DO YOU WANT THE D STATISTIC?
ENTER THE MAX AR ORDERS
ENTER THE MAX MA ORDER?
DO YOU WANT TO SEE THE D STAT?
0=YES, 1=NO-->0

D STATISTIC

	ORDER OF MA		
ORDER OF AR	0	1	2
0	.5408E+00	.8112E+01	.7408E+00
1	.1488E-02	.9838E-01	.8091E-02
2	.1108E-06	.8504E-04	.1294E+00
3	.1131E-04	.1354E-02	.9472E-01
4	.2871E+00	.2911E+01	.1978E-02
5	.2431E-01	.2847E-05	.1382E-01

ORDER OF AUTOREGRESSION SELECTED   1
ORDER OF MOVING AVERAGE SELECTED   1
DO YOU WANT ANOTHER D STATISTIC?Y
ENTER THE MAX AR ORDER?
ENTER THE MAX MA ORDER?
DO YOU WANT TO SEE THE D STAT?
0=YES, 1=NO-->0

D STATISTIC

	ORDER OF MA		
ORDER OF AR	0	1	2
0	.4851E+01	.8589E-01	.2012E-01
1	.1792E-04	.8153E-01	.4791E-02
2	.8802E-04	.2801E-04	.3329E-01
3	.4508E-05	.4787E-01	.3705E-03
4	.8844E+00	.1558E-01	.2907E+01
5	.2052E-05	.1231E-03	.1386E-01
6	.1458E+01	.1599E-03	.2985E-03
7	.1164E-10	.1917E-02	.7585E-02

ORDER OF AUTOREGRESSION SELECTED   0
ORDER OF MOVING AVERAGE SELECTED   0
DO YOU WANT ANOTHER D STATISTIC?

APPENDIX H

Residual Analysis of Separation Data

using an ARIMA(4,1,1) Model

THIS PROGRAM GENERATES THE RESIDUALS FOR SEP ANALYSIS MODEL
MODEL CHOSEN IS ARIMA(4,1,1)
EQUATION MODELED IS:
$Z(T) = .54192 Z(T-1) - .15222 Z(T-2) - .01092 Z(T-3) + .34512 Z(T-4) = -.08025 A(T) - .76712 A(T-1)$

MEAN = -.00347830056232   VARIANCE = .00461389356481

LAG	AUTOCOV.	AUTOCORR.	PART.AUTOCORR.
1	-.000117	-.025359	-.025359
2	-.000189	-.041046	-.041716
3	-.000027	-.005823	-.007985
4	-.000024	-.005203	-.003131
5	.000064	.013813	.013487
6	.000233	.050426	.051591
7	.000930	.201697 *	.206743 *
8	-.000774	-.167693	-.157457
9	-.000083	-.018061	-.007772
10	.000045	.009677	.002026
11	.000484	.104927	.105434
12	.001346	.291666 *	.311042 *
13	.000419	.090717	.116670
14	.000300	.065083	.086311
15	-.000560	-.121488	-.055774
16	-.000449	-.097320	-.165603
17	-.000286	-.062102	-.138349
18	.000425	.092120	.000051
19	.000303	.065588	.009449
20	.001208	.261836 *	.226573 *
21	-.000066	-.014281	-.039177
22	-.000422	-.091573	-.110061
23	.000593	.128628	.120487
24	.000166	.035945	.069664
25	.000428	.092820	.161446
26	.000817	.177157	.117016
27	-.000256	-.055547	-.039686
28	-.000935	-.202752	.008841
29	-.000723	.156744	-.155368
30	.000157	-.033935	.075908
31	-.000771	-.167167	.010030
32			.002389
33	-.000530	-.114930	-.155419

UNCONDITIONAL SUM OF SQUARES FOR A: .31045841742...
UNCONDITIONAL SUM OF SQUARES FOR E: .31045860465...

PORTMANTEAU LACK OF FIT TEST = 32.34829991896

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE

1	.015	1	.081
2	.030	2	.087
3	.045	3	.099
4	.061	4	.104
5	.076	5	.154
6	.091	6	.184
7	.106	7	.198
8	.121	8	.201
9	.136	9	.213
10	.152	10	.214
11	.167	11	.396
12	.182	12	.406
13	.197	13	.410
14	.212	14	.414
15	.227	15	.460
16	.242	16	.464
17	.258	17	.490
18	.273	18	.548
19	.288	19	.576
20	.303	20	.626
21	.318	21	.660
22	.333	22	.735
23	.348	23	.738
24	.364	24	.744
25	.379	25	.763
26	.394	26	.789
27	.409	27	.794
28	.424	28	.896
29	.439	29	.921
30	.455	30	.922
31	.470	31	.970
32	.485	32	.976
33	.500	33	1.024

APPENDIX I

Separation's Time Series Analysis

Computer Output (Seasonally Differenced Data)

ENTER TITLE SEP ANALYSIS DIFF:2
DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?Y
WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE:ID1)>=00
WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING:ID2)>=0(
TRANSFORMATION COEFF: IP=0 (LN),IP>0(Z(I)=Z(I)**IP))1
LENGTH OF SEASON: IS)=0:2
SEP ANALYSIS DIFF12
MEAN = -.023618181818 VARIANCE = .013203290057851

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y
LAG AUTOCOVARIANCE AUTOCORRELATION PARTIAL AUTOCORRELATION

1	.039573	.725045X	.725045
2	.009184	.695616X	.358259
3	.009138	.692087X	.262846
4	.007790	.590029X	-.055950
5	.006705	.507857X	-.127592
6	.006198	.469414X	-.032775
7	.006383	.483437X	.192836
8	.005214	.394892X	.033490
9	.003952	.299336X	.215392
10	.003525	.266973X	-.135218
11	.002027	.153552	.169774
12	.000075	.005653	-.242422
13	.000528	.040014	.196788
14	-.000380	-.028791	.058254
15	-.001349	-.102208	-.053799
16	-.001492	-.112995	-.053418
17	-.002049	-.155203	-.095760
18	-.002284	-.172975	.106035
19	-.002765	-.209434	-.199947
20	-.003244	-.245660X	-.076476
21	-.002546	-.192822	.054889
22	-.002965	-.224598	-.031993
23	-.002494	-.188865	.027662
24	-.003210	-.243147	.260372
25	-.002981	-.225761	.031570
26	-.002949	-.223371	.050442
27	-.003480	-.263553X	-.077629

THE APPROXIMATED 2 S.E. BAND IS +/- .2443

X-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

i	FO	P	INTNCTY
1	.018	55.000	.426
2	.036	27.500	.110
3	.055	18.333	.007
4	.073	13.750	.001
5	.091	11.000	.019
6	.109	9.167	.010
7	.127	7.857	.225
8	.145	6.875	.004
9	.164	6.111	.001
10	.182	5.500	.003
11	.200	5.000	.005
12	.218	4.583	.025
13	.236	4.231	.001
14	.255	3.929	.015
15	.273	3.667	.017
16	.291	3.438	.014
17	.309	3.235	.003
18	.327	3.056	.000
19	.345	2.895	.008
20	.364	2.750	.015
21	.382	2.619	.005
22	.400	2.500	.001
23	.418	2.391	.015
24	.436	2.292	.001
25	.455	2.200	.001
26	.473	2.115	.012
27	.491	2.037	.004

(F(N) = ((-1)XM)XACF(N))

R-ARRAY

S-ARRAY

(F(R) * ACF(R))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	-.1022	-.0670	.1143	-.1795	.1490	-.2058	-.0536	-.6217	1.2017	43.7068
(-14)	-.0288	-.0256	.0308	-.1682	-.3160	-.3147	-.6168	-9.2771	1.2466	-1.8199
(-13)	.0400	-.1779	.1622	-.2006	-.3164	-36.5912	-.6795	-.3923	-.4756	-2.2300
(-12)	.0057	-.1492	.4590	-.3776	-.2954	-2.8376	-.4694	-.8380	2.3982	-8.1685
(-11)	.1536	-.2232	.0116	-.3759	11.5306	-.1970	.0387	-.8562	2.2451	3.7035
(-10)	.2670	-.4889	.3601	-.3842	-.1349	-1.5440	.7462	-1.0828	1.8929	2.6378
(-9)	.2993	-.1175	.5903	.3213	.1782	-.1328	.2626	-1.1813	3.3506	-2.1321x
(-8)	.3949	-.5460	-1.0324	-.8548	-.3683	-.5448	.1288	-.4045	2.7175x	.2883
(-7)	.4834	-1.7947	.2086	-1.7194	-.8977	-2.7728	1.2887	-2.8116x	-.5853	.3436
(-6)	.4694	.4955	.7891	.0875	1.0287	-.8068	2.3571x	.0942	-.6545	.6759
(-5)	.5079	.5079	.6620	-.9736	5.5255	-2.4370x	.4545	.5147	-.5193	13.4545
(-4)	.5900	.0407	-5.7528	-.4964	2.7934x	-.0799	-.3883	.2460	.4901	1.2395
(-3)	.6921	-.6717	-494.2394	-2.9589x	-.3564	-.6315	.0468	.2688	.3938	.9057
(-2)	.6956	5.0756	2.3431x	.3244	-.6269	.4472	-.1864	.3151	.9156	-6.5369
(-1)	.7250x	5.7740	6.159	.0336	.3972	.0503	-.0345	.3001	-.9315	0.0000
(0)	1.0000x	-1.7250x	-164.5956	-.3584	.2896	.1532	-.3297	.6275	-.6626	0.0000
(1)	.7250	-.6180	-2.2411	-1.6416	-.1898	1.4141	.6592	-.2597	0.0000	0.0000
(2)	.6987	-.6087	.1939	.7633	-.1355	.4681	.5815	-6.2597	0.0000	0.0000
(3)	.6921	19.4240	1.2589	.4582	-.4458	-2.0937	.0496	0.0000	0.0000	0.0000
(4)	.5900	-.0328	-1.6896	.4310	-.4339	-33.9161	-.2202	0.0000	0.0000	0.0000
(5)	.5079	-.2318	.2458	.3306	2.0768	-.3409	-.1468	0.0000	0.0000	0.0000
(6)	.4694	-.6547	.0181	.4618	-.1831	-.1468	0.0000	0.0000	0.0000	0.0000
(7)	.4834	-3.4475	-.3787	.2993	.8641	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	.3949	-.1268	.5174	.1113	-.1915	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	.2993	-.1656	-.0108	.1059	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	.2670	.7821	-.0922	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	.1536	.1946	.0551	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.0057	-.0413	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	.0400	-.0513	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	-.0288	.0715	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	-.1022	.0980	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	-.1130	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-.7183	-1.4754	3.7243	1.1322	-.4030	-.3519	5.1516	-.5729	-.0186
(-14)	1.0000	-2.3898	-5.0999	-17.9708	-.1292	-.6655	-.4119	-.0412	-.4987	-.6718
(-13)	1.0000	-.8587	-4.2164	-.6699	.3326	-.0036	-.4249	.5207	1.0863	1.8990
(-12)	1.0000	26.1649	-.3660	.3771	.0539	-.4390	-.3080	.9559	.4698	.0540
(-11)	1.0000	-.7387	-.3868	-11.9466	.0115	.3310	.0417	21.6751	-.8461	-.1425
(-10)	1.0000	-.1212	-.3960	.5224	-.3349	.1524	-1.0677	-3.1959	.9082	-.4213
(-9)	1.0000	.3192	.8175	.1824	-.4755	1.1682	-4.9314	-9.9836	-.5470	-.7529X
(-8)	1.0000	-.2242	-.0663	.1256	-.3808	1.5894	2.5547	.6695X	-3.9842X	-.1622X
(-7)	1.0000	-.0290	-.1045	-.4133	-.4624	-.6248	.3673	-.1291X	-.1334X	-.0823
(-6)	1.0000	-.0819	-.1485	.4872	.4201	-1.0592	4.8802X	-.1559	-.6960	.0391
(-5)	1.0000	.1618	-3.0250	.4228	4.2801	-1.2138X	.1599X	-.3624	.1891	.0118
(-4)	1.0000	.1730	-.0436	.4944	-.2423	-1.1549X	1.0702	-2.2684	.2100	-.3119
(-3)	1.0000X	.0651	.0058	.4949X	-2.4548X	-.1702	-.4120	1.0035	-.3890	-1.2933
(-2)	1.0000X	.0423	-.4925X	-.1301X	-.1373X	-.2412	.4551	-8.1512	.3866	-.0139
(-1)	1.0000	-.3792X	-.1764X	.1650	-.1583	-.5128	-1.2318	-.7313	.7978	-.1116
(0)	1.0000	-2.2750X	.0026	-.1647	.1477	-.6218	-.9540	-.0352	-.4275	0.0000
(1)	1.0000	-.2406	.1670	.1622	1.8937	-.1159	-.7316	-.4143	0.0000	0.0000
(2)	1.0000	-.0051	.1477	.1016	.3636	1.0936	.2988	-2.0734	0.0000	0.0000
(3)	1.0000	.1475	.8451	.7582	.4056	-.0546	.3818	0.0000	0.0000	0.0000
(4)	1.0000	-.1393	.1381	.2985	.4777	.0251	.3812	0.0000	0.0000	0.0000
(5)	1.0000	.0757	.1274	.2175	.0129	-.3851	.6275	0.0000	0.0000	0.0000
(6)	1.0000	.0299	.1850	-.5989	.0560	-1.1021	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-.1832	.5579	12.3594	.3539	-.9149	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-.2420	.6188	-.7552	.1927	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	.1081	.3191	-1.1920	.7489	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-.4248	1.1678	11.1381	-.5402	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-.9632	1.4717	-1.6561	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	6.0789	4.1142	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-1.7195	-.9449	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	2.5500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-.1055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

D STATISTIC

ORDER OF AR	ORDER OF MA 0	1	2	3	4	5	6
0	.4135E+00	.1689E+00	.1068E+00	.3004E+00	.4801E-01	.1261E-01	.6982E+00
1	.1317E-02	.1154E-01	.2655E+00	.5206E-01	.4313E+00	.2420E+00	.1581E+01
2	.1035E-04	.2456E-02	.8221E-02	.2934E-06	.1390E+01	.1229E+01	.2970E+01
3	.5833E-01	.3066E-01	.3044E-04	.4677E-03	.6740E-01	.7286E+01	.3799E-02
4	.2335E-05	.8019E-01	.2137E-03	.4996E+01	.1433E-01	.2456E-02	.3237E-02
5	.3992E+00	.5946E-01	.5055E-01	.1660E-01	.3698E-02	.4419E-03	.5960E-04
6	.2842E-06	.3907E-01	.1597E-01	.7809E-03	.1219E+00	.2459E-01	.5517E-01

D STATISTIC

ORDER OF AR	ORDER OF MA 0	1	2	3	4
0	.4491E-01	.3913E-01	.1463E+00	.2889E+00	.2207E+00
1	.3781E-03	.1388E-01	.1227E+00	.1378E+00	.424SE-01
2	.1243E-04	.1149E-02	.2295E-01	.4205E-04	.4042E+00
3	.1612E-01	.8023E-01	.5427E-04	.1404E-02	.3340E-02

ENTER TITLE SEP ANAL DIFF12,1
DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?Y
WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE(ID1)=01
WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING(ID2)=00
TRANSFORMATION COEFF; IP=0 (LN),;IP>0(Z(I)=Z(I)xxIP)1
LENGTH OF SEASON(IS)=00
SEP ANAL DIFF12,1
MEAN = -.0031851851851.185 VARIANCE = .00710774384224

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y

LAG	AUTOCOVARIANCE	AUTOCORRELATION	PARTIAL AUTOCORRELATION
1	-.003079	-.433164*	-.433164
2	.000649	.091136	-.34113
3	.001439	.202451	.001097
4	-.002386	-.054327	.045547
5	-.000451	-.063444	.009238
6	.000751	.105616	-.231472
7	.001320	.185702	-.200849
8	-.000038	-.005397	-.129782
9	.001131	.159139	-.008703
10	-.001362	-.191619	.092520
11	.000511	.071841	.196185
12	.002770	.387775*	.299120
13	.001618	.227569	.111639
14	.000028	.003991	.059009
15	.000921	.129579	.062125
16	.000387	.054382	.022214
17	-.000275	-.038724	-.145805
18	.000441	.062047	-.188593
19	-.000007	-.001041	.106470
20	.001048	.147382	-.104903
21	.001261	.177363	.016452
22	-.001193	-.167865	-.077112
23	.001096	.154235	.197919
24	-.000574	-.080792	-.132410
25	.000482	.067783	-.083626
26	-.000808	-.113641	.091278
27	.000862	.121213	-.134680

THE APPROXIMATED 2 S.E. BAND IS +/-   .2443

*=DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

LW= 54
HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
0 = DEFAULT OF 45; N.LT. LW/2 =>27

I	FO	P	INTNCTY
1	.019	54.000	.003
2	.037	27.000	.004
3	.056	18.000	.003
4	.074	13.500	.001
5	.093	10.800	.002
6	.111	9.000	.009
7	.130	7.714	.009
8	.148	6.750	.002
9	.167	6.000	.000
10	.185	5.400	.002
11	.204	4.909	.004
12	.222	4.500	.020
13	.241	4.154	.001
14	.259	3.857	.205
15	.278	3.600	.033
16	.296	3.375	.056
17	.315	3.176	.032
18	.333	3.000	.001
19	.352	2.842	.008
20	.370	2.700	.027
21	.389	2.571	.073
22	.407	2.455	.032
23	.426	2.348	.032
24	.444	2.250	.013
25	.463	2.160	.036
26	.481	2.077	.004
27	.500	2.000	.002

SER ANAL DIFF12,1

AUTOCORRELATION PLOT

-.476   .476

LAG 1–27

SEP ANAL DIFF18,1

PARTIAL AUTOCORRELATION PLOT

-.476 .... .476

LAG
1
2
3
4
5
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26
27
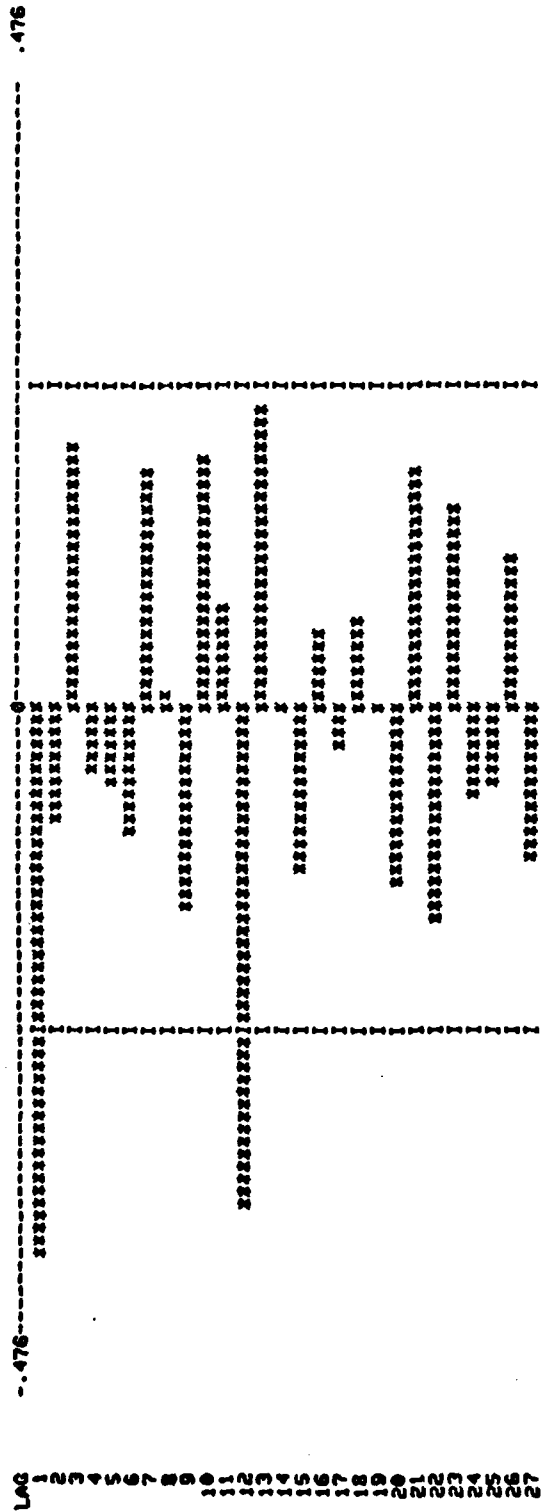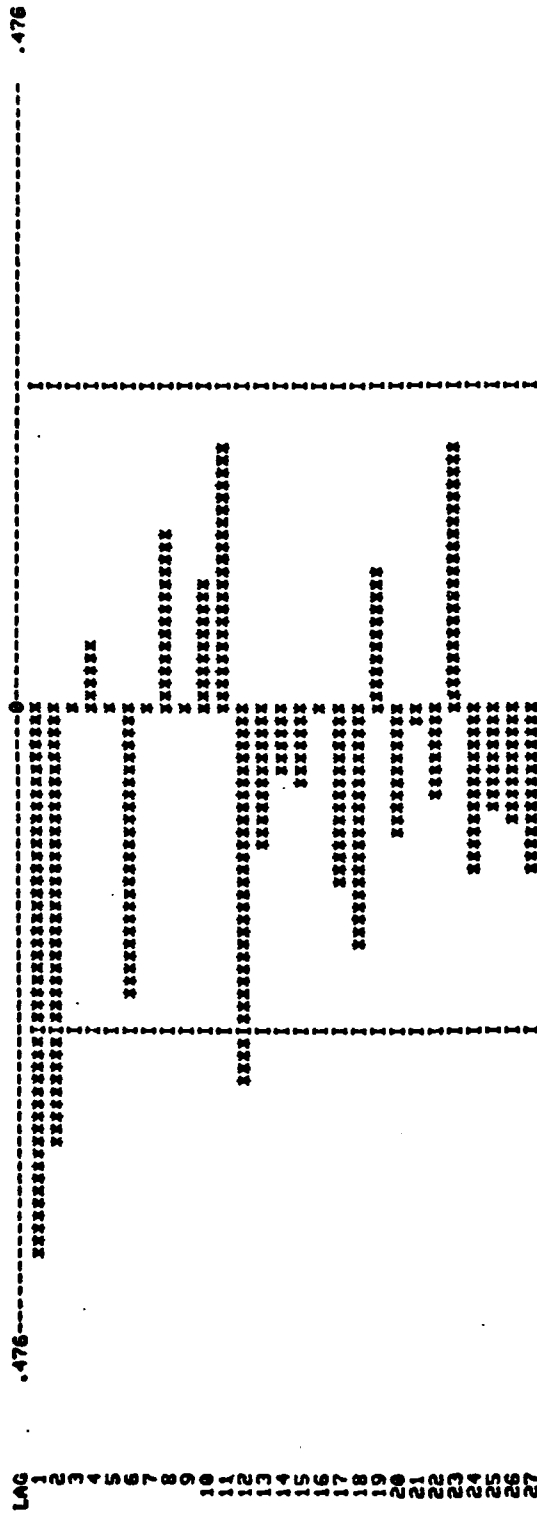
FIRST LINE VAR(R(K)),SECOND LINE STD(R(K))

1	2	3	4	5	6	7	8	9	10
.017012	.028584	.023949	.034608	.038558	.020954	.030520	.034409	.030707	.025756
.130429	.169069	.154755	.186033	.196365	.144756	.174701	.185496	.175234	.160486

236

(F(N) = ((-1)**N)*ACF(N))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-.9692	1.1269	-6.3243	1.1918	-1.5278	-135.7599	-.3549	2.1028	-25.4950
(-14)	1.0000	-58.0261	1.8734	-1.1039	5.4937	-1.4982	-3.7577	-1.8759	-.0774	-26.2082
(-13)	1.0000	.7128	1.0608	.6830	7.0767	.8816	-7.7680	-1.0925	24.6823	-12.7345
(-12)	1.0000	-.8157	.9386	-5.2545	2.416	4.2719	4.8083	-.4603	15.4044	-1.6006
(-11)	1.0000	-3.6673	.8631	-2.1409	22.6015	.5364	4.2042	-16.1998	-5.0355	5.8377
(-10)	1.0000	-.1695	.7175	-2.0511	.4555	-1.6095	4.4959	-5.7532	-.3400	5.4261
(-9)	1.0000	-.9661	1.6527	1.5037	-.2905	-3.1965	6.4930	55.3053	-5.4982	87.9037x
(-8)	1.0000	-35.4109	1.1046	-.0658	-1.20:3	-2.8465	6.2365	-3.8094	-5.9464x	-.7650x
(-7)	1.0000	-.4313	1.6573	.2725	2.8434	363.2553	3.8458	1044.7179x	.7717x	7.4386
(-6)	1.0000	-1.6207	-22.7197	-2.6817	2.6703	16.4702	3.8345x	-.8868x	.7133	-1.7012
(-5)	1.0000	-1.8563	2.2198	5.7271	-12.5238	78.0192x	-.8876x	134.8140	.0989	-1.3215
(-4)	1.0000	2.7265	2.4990	-2.2720	-15.9719x	-.7207x	.8901	-1.2074	1.6022	-3.9264
(-3)	1.0000	.5498	2.2062	-694.7568x	.5732	-.9468	1.2914	15.9948	5.4790	1.9969
(-2)	1.0000	-5.7530	2.2187x	-32.3713	4.5398	-4.7019	1.3436	-3.4327	-.8232	3.6473
(-1)	1.0000	1.3086x	.7613x	-6772	4.7365	-76.5118	2.0569	.2829	-.1163	3.5894
0	1.0000	-5.5668x	.7597	.6772	.0833	-.7546	2.4800	.8078	-3.6584	0.0000
1	1.0000	-1.2104	.5380	-14.2766	.1038:	-.5944	2.3008	1.7576	-1.7151	0.0000
2	1.0000	1.2214	.9727	-.2694	.7017	-1.5306	2.7473	.3948	0.0000	0.0000
3	1.0000	-.7317	-2.4634	-.8031	-.6644	-1.5575	-9.0359	1.4653	0.0000	0.0000
4	1.0000	-2.1678	1.6882	-3.0185	2.8302	-1.2365	-4.5747	1.4641	0.0000	0.0000
5	1.0000	-2.6647	1.3930	-2.5734	16.0890	4.5113	-113.8048	0.0000	0.0000	0.0000
6	1.0000	.7583	.5892	-1.9815	2.8410	4.6252	0.0000	0.0000	0.0000	0.0000
7	1.0000	-1.0291	1.7109	-1.7316	2.8059	2.4641	0.0000	0.0000	0.0000	0.0000
8	1.0000	28.4887	1.6560	-18.8868	.6750	0.0000	0.0000	0.0000	0.0000	0.0000
9	1.0000	.2041	1.8011	.8856	12.0059	0.0000	0.0000	0.0000	0.0000	0.0000
10	1.0000	-1.3749	.7371	-1.8818	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	1.0000	4.4256	.6233	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	1.0000	-.4162	1.1248	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1.0000	-1.0175	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1.0000	31.4710	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	1.0000	-.5863	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(2,0)

(F(H) = ACF(H))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10

S-ARRAY

(d,o)

DO YOU WANT THE D STATISTIC?v
ENTER THE MAX AR ORDER3
ENTER THE MAX MA ORDER0
DO YOU WANT TO SEE THE D STAT?
0=YES, 1=NO-->0

D STATISTIC

ORDER OF MA
0

ORDER OF AR	
0	.2944E+02
1	.1859E-04
2	.7058E+04
3	.4544E-14

ORDER OF AUTOREGRESSION SELECTED 2
ORDER OF MOVING AVERAGE SELECTED 0
DO YOU WANT ANOTHER D STATISTIC?v
ENTER THE MAX AR ORDER3
ENTER THE MAX MA ORDER1
DO YOU WANT TO SEE THE D STAT?
0=YES, 1=NO-->0

D STATISTIC

ORDER OF MA		
	0	1

ORDER OF AR		
0	.2944E+02	.3125E-02
1	.1859E-04	.3642E+00
2	.7058E+04	.1985E-03
3	.4544E-14	.2937E-01

ORDER OF AUTOREGRESSION SELECTED 2
ORDER OF MOVING AVERAGE SELECTED 0
DO YOU WANT ANOTHER D STATISTIC?v

THIS PROGRAM GENERATES THE RESIDUALS FOR THE SEP ANAL.
MODEL CHOSEN IS ARMA(1,0)
EQUATION MODELED IS:
Z(T)=-.82301Z(T-1)+.3329*A(T)

MEAN=.118976675043   VARIANCE=.005251422365458

LAG	AUTOCOV.	AUTOCORR.	PART.AUTOCORR.		
1	-.000048	-.009086	-.009086	.045	.073
2	.000601	.114483	.114410	.060	.085
3	.000437	.083128	.086225	.075	.169
4	-.000946	-.180146	-.195051	.090	.279
5	-.000441	-.084043	-.113474	.104	.313
6	-.000715	-.136148	-.105893	.119	.313
7	-.000231	-.044057	-.105151	.134	.329
8	-.001147	-.218439	-.218604	.149	.335
9	-.000344	-.065508	-.032817	.164	.432
10	-.000466	-.088710	-.084562	.179	.432
11	-.000856	-.162934	-.232560	.194	.433
12	.001851	.352490	.293898	.209	.435
13	.000642	.122225	.109633	.224	.453
14	.000632	.120297	.025536	.239	.459
15	.000351	.066751	.034542	.254	.465
16	-.000439	-.083689	-.029697	.269	.496
17	-.000787	-.149839	-.065788	.284	.513
18	.000255	.048485	.048687	.299	.550
19	.000108	.020603	.040540	.313	.574
20	.001265	.240954	.198628	.328	.644
21	.000526	.100235	.004117	.343	.662
22	.000392	.074725	-.138807	.358	.688
23	.000924	.175981	.074681	.373	.704
24	.001170	.222850	.053001	.388	.750
25	.000025	.004808	.156602	.403	.757
26	.000733	.139577	.015470	.418	.822
27	.000724	.137873	.035998	.433	.928
28	.000042	.008033	.074403	.448	.940
29	.001095	.208446	.112358	.463	.989
30	.000125	.023756	.054701	.478	.992
31	-.000446	-.084966	-.013233	.493	1.000
32	-.000973	-.185304	-.025270		
33	-.000284	-.054142	-.205362		
34		.000000			
35		.000000			
36		.000000			
37		.000000			
38		.000000			
39		.000000			
40		.000000			
41		.000000			
42		.000000			
43		.000000			
44		.000000			
45		.000000			

UNCONDITIONAL SUM OF SQUARES FOR A= 1.36651371631
UNCONDITIONAL SUM OF SQUARES FOR E= 1.36651782431

PORTMANTEAU LACK OF FIT TEST = 42.7637259895

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE
INPUT ANY NUMBER AFTER CLEARING SCREEN)
1 .015   .060
2 .030   .060

242

APPENDIX J

Residual Analysis of Separation Data

using an ARIMA(2,1,0)*(1,1,0)$_{12}$ Model

THIS PROGRAM GENERATES THE RESIDUALS FOR THE SEP ANAL.
MODEL CHOSEN IS ARIMA(2,1,0)X(1,1,0)SUB12

MEAN=-.00014215383465571   VARIANCE=.0040603424198214

LAG	AUTOCOV.	AUTOCORR.	PART.AUTOCORR.
1	-.000134	-.033006	-.033006
2	-.000053	-.012951	-.014056
3	-.000100	-.024661	-.023794
4	-.000023	-.005679	-.007123
5	-.000617	-.151839	-.151066
6	-.000823	-.202579	-.218300
7	-.000988	-.243253	-.236057
8	-.000092	-.022647	-.051098
9	-.000247	-.060872	-.078751
10	-.000271	-.066848	-.036807
11	-.000338	-.083238	-.020170
12	-.000761	-.187421	-.184427
13	-.003653	-.160773	-.083303
14	-.003837	-.009068	-.020732
15	-.000540	-.132990	-.104447
16	-.000032	-.007955	-.000574
17	-.000389	-.095802	-.170085
18	-.000387	-.095315	-.052597
19	-.000193	-.047564	-.086579
20	-.000666	-.164067	-.157406
21	-.000134	-.032924	-.006526
22	-.000086	-.021217	-.040503
23	-.000432	-.106386	-.138413
24	-.000991	-.244110	-.211213
25	-.000056	-.013878	-.056179
26	-.000368	-.090510	-.021670
27	-.000444	-.109425	-.089720

UNCONDITIONAL SUM OF SQUARES FOR A= .22454407715
UNCONDITIONAL SUM OF SQUARES FOR E= .22479978049447

PORTMANTEAU LACK OF FIT TEST = 19.4307501004 8

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE

1	.019	.047
2	.037	.078
3	.056	.105
4	.074	.113
5	.093	.159
6	.111	.255
7	.130	.304
8	.148	.322
9	.167	.328
10	.185	.349
11	.204	.374
12	.222	.429
13	.241	.432
14	.259	.469
15	.278	.593
16	.296	.641
17	.315	.694
18	.333	.695
19	.352	.719
20	.370	.737
21	.389	.800
22	.407	.802
23	.426	.894
24	.444	.944
25	.463	.990
26	.481	.996
27	.500	1.004

APPENDIX K

Retirement's SPSS Regression Output Listings

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

```
RUN NAME          RETIREMENT PROJECTIONS, 1ST MONTH
VARIABLE LIST     ACCOMP,VOL,MAND,TIME
INPUT MEDIUM      DISK
N OF CASES        44
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,VOL,MAND,TIME
LIST CASES        CASES=44/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                  REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                  REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS        ALL
```

00054400 CM NEEDED FOR REGRESSION

```
OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

RETIREMENT PROJECTIONS, 1ST MONTH

FILE NONAME (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	221.	193.	24.	1.
2	202.	252.	18.	2.
3	171.	143.	19.	3.
4	760.	240.	16.	4.
5	184.	171.	9.	5.
6	210.	182.	23.	6.
7	204.	174.	23.	7.
8	228.	190.	32.	8.
9	360.	314.	43.	9.
10	697.	484.	208.	10.
11	458.	404.	44.	11.
12	403.	303.	21.	12.
13	282.	251.	23.	13.
14	222.	196.	20.	14.
15	162.	150.	9.	15.
16	219.	203.	11.	16.
17	228.	205.	11.	17.
18	700.	179.	17.	18.
19	187.	175.	10.	19.
20	201.	186.	10.	20.

```
21.      299.      283.      14.       21.
22.      469.      434.      36.       22.
23.      577.      479.      144.      23.
24.      426.      412.      12.       24.
25.      245.      210.      31.       25.
26.      191.      171.      20.       26.
27.      147.      123.      21.       27.
28.      130.      161.      14.       28.
29.      144.      144.      17.       29.
30.      131.      116.      6.        30.
31.      171.      153.      13.       31.
32.      152.      124.      26.       32.
33.      184.      168.      15.       33.
34.      283.      257.      21.       34.
35.      313.      272.      40.       35.
36.      193.      164.      28.       36.
37.      361.      333.      21.       37.
38.      345.      330.      15.       38.
39.      207.      107.      22.       39.
40.      206.      183.      22.       40.
41.      250.      159.      88.       41.
42.      185.      166.      16.       42.
43.      134.      173.      14.       43.
44.      148.      170.      14.       44.
```

IRETIREMENT PROJECTIONS, 1ST MONTH

IRETIREMENT PROJECTIONS, 1ST MONTH

FILE   NONAME   (CREATION DATE = 10/14/82)   * * * * * * * * * M U L T I P L E   R E G R E S S I O N *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	257.5682	120.6955	44
VOL	225.0455	96.6506	44
MAND	28.6591	35.8908	44
TIME	22.5000	12.8452	44

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

```
            .96072    .55609   -.21378   -.07987
VOL
MAND       .74481   -.21378   -.07987
TIME      -.20708

          ACCOMP     VOL      MAND
```

IRETIREMENT PROJECTIONS, 1ST MONTH   10/14/82   21.00.26.   PAGE   5

FILE   NONAME   (CREATION DATE = 10/14/82)   * * * * * * * * * M U L T I P L E   R E G R E S S I O N *
$DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   257.56818   STD. DEV.   120.69554

VARIABLE(S) ENTERED ON STEP NUMBER 1..   VOL

                                                                                                  10/14/82   21.00.26.   PAGE   3
                                                                                                  10/14/82   21.00.26.   PAGE   4

MULTIPLE R   .96872
R SQUARE   .93843

ADJUSTED R SQUARE   .93696
STD DEVIATION   30.30375

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
REGRESSION	1.	587029.47365	587029.47365	640.11696	.00
RESIDUAL	42.	38569.32181	918.31719		
COEFF OF VARIABILITY	11.0 PCT				

--------- VARIABLES IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY
VOL	1.2097251	.47014254E-01	640.11595	.000	.9687244
(CONSTANT)	-14.674962	11.698023	1.5758803	.216	1.05698

--------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
MAND	.99552	.69876	4542.7288	0
TIME	-.00158	.95451	.10262599E-0	.992

* *

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R   .99972
R SQUARE   .99945

ADJUSTED R SQUARE   .99942
STD DEVIATION   2.90076

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
REGRESSION	2.	626053.00511	313026.90255	37201.33927	.00
RESIDUAL	41.	344.99035	8.41440		
COEFF OF VARIABILITY	1.1 PCT				

--------- VARIABLES IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY
VOL	1.0033228	.55069203E-02	33194.328	0	.8034414
MAND	.99953677	.14029973E-01	4542.7288	0	.87663
(CONSTANT)	3.1291309	1.1497575	7.4068736	.009	.2972218
					.11122

--------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
TIME	-.52983	.95225	15.611122	.000

RETIREMENT PROJECTIONS, 1ST MONTH

FILE NONAME (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * *
DEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

10/14/82   21.08.26.   PAGE   6

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R   .99980
R SQUARE   .99960

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
REGRESSION	3.	626150.65060	200716.88353	33644.36177	.00

ADJUSTED R SQUARE .99957   RESIDUAL   240.14406   6.20362
STD DEVIATION   2.49071   COEFF OF VARIABILITY   40.0 PCT
                                                        1.0 PCT

------------ VARIABLES IN THE EQUATION ------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	.99942262	.48303981E-02	42808.747	.8003182				
MAND	1.0019892	.12740726E-01	6177.2113 .000	.87323 .2979511				
TIME	-.11972608	.30302010E-01	.000	.11149 -.012742.0				
(CONSTANT)	6.6304000	1.3266065	15.61112 .000	-.01046				
			24.980168 .000					

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	.99942262	.48303981E-02	206.90275	.90966003 : 1.0091052
MAND	1.0019892	.12740726E-01	78.595237	.97622301 : 1.0277553
TIME	-.11972608	.30302010E-01	-3.9510913	-.18096865 : -.58483359E-01
CONSTANT	6.6304000	1.3266065	4.998016	3.9492282 : 9.3116717

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MAND	TIME
VOL	.00002		
MAND	-.00003	.00016	
TIME	.00003	-.00002	.00092

1RETIREMENT PROJECTIONS, 1ST MONTH   10/14/82   21.00.26.   PAGE   7

FILE NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   *
0DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		640.11595	.000	.96872	.93043	.93043	.96872	640.11595	.000
2	MAND		4542.72079	.0	.99972	.99945	.86102	.7401	37201.33927	.000
3	TIME		15.61112	.000	.99980	.99960	.00015	-.20700	33644.36177	.000

1RETIREMENT PROJECTIONS, 1ST MONTH   10/14/82   21.00.26.   PAGE   8

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MULTIPLE REGRESSION

OBSERVATION	V VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2S
1.	221.0000	223.4470	-2.44690#			R
2.	282.0000	276.2013	5.718746			
3.	171.0000	168.2265	2.773549			
4.	260.0000	260.0459	-.4596908E-01			
5.	184.0000	185.9409	-1.950941			
6.	210.0000	210.8477	-.8527121			
7.	204.0000	202.7376	1.262395			
8.	228.0000	227.6265	.3734566			
9.	360.0000	362.4571	-2.457103			
10.	697.0000	697.5474	-.5674335			
11.	458.0000	453.1677	4.832323			
12.	408.0000	409.0143	-1.014325			
13.	282.0000	278.9748	3.025289			
14.	222.0000	220.8809	1.119147			
15.	162.0000	163.7630	-1.763006			
16.	219.0000	218.6115	.3885437			
17.	220.0000	220.4916	-.4905766			
18.	200.0000	200.4058	-.4057972			
19.	187.0000	189.2746	-2.274457			
20.	201.0000	200.1484	.8516205			
21.	299.0000	300.9806	-1.980605			
22.	469.0000	473.8175	-4.817456			
23.	577.0000	576.9154	.8455450E-01			
24.	426.0000	427.5430	-1.542967			
25.	245.0000	244.5777	.4223354			
26.	191.0000	194.4586	-3.458576			
27.	147.0000	147.3606	-.3605520			
28.	182.0000	170.2138	1.787038			
29.	165.0000	165.1984	-.1804419			
30.	171.0000	174.9836	-3.983579			
31.	171.0000	168.8564	2.143586			
32.	152.0000	152.7793	-.7792912			
33.	184.0000	185.6173	-1.612200			
34.	203.0000	208.4531	-5.46090			
35.	313.0000	314.3625	-1.362510			
36.	193.0000	194.2013	-1.201279			
37.	361.0000	356.0500	4.949956			
38.	345.0000	344.9213	.7073414E-01			
39.	217.0000	218.8969	-3.896878			
40.	206.0000	206.7795	-.7794614			
41.	250.0000	248.8049	1.195124			
42.	135.0000	133.5379	1.462118			
43.	139.0000	138.4390	.5609873			
44.	146.0000	142.3164	4.683600			

NOTE — (#) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 44.
NUMBER OF 2 S.D. OUTLIERS 1. OR 2.27 PERCENT OF THE TOTAL
RETIREMENT PROJECTIONS, 1ST MONTH

10/14/82 21.00.26. PAGE 9

VON NEUMANN RATIO	2.85758	DURBIN-WATSON TEST	2.81874

NUMBER OF POSITIVE RESIDUALS   28.
NUMBER OF NEGATIVE RESIDUALS   24.
NUMBER OF RUNS OF SIGNS   26.

EXPECTED NUMBER OF RUNS OF SIGNS   23.
EXPECTED S.D. OF RUN DISTRIBUTION   3.25918
UNIT NORMAL DEVIATE-
   Z-(EXPECTED-OBSERVED)/S.D.   1.13283
PROBABILITY OF OBTAINING .GE. ABS(Z)   .12864

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

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RUN NAME         RETIREMENT PROJECTIONS, 2ND MONTH
VARIABLE LIST    ACCOMP,VOL,MAND,TIME
INPUT MEDIUM     DISK
N OF CASES       43
INPUT FORMAT     IRFFFIFLD
VAR LABELS       ACCOMP,VOL,MAND,TIME
LIST CASES       CASES=43/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION       METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                 REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                 REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS       ALL
```

00054600 CM NEEDED FOR REGRESSION

```
OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
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1RETIREMENT PROJECTIONS, 2ND MONTH

FILE NONAME (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	282.	251.	11.	1.
2	171.	140.	14.	2.
3	260.	237.	8.	3.
4	104.	177.	7.	4.
5	218.	182.	22.	5.
6	204.	169.	18.	6.
7	228.	190.	27.	7.
8	360.	319.	39.	8.
9	697.	483.	202.	9.
10	458.	408.	44.	10.
11	408.	383.	19.	11.
12	282.	254.	16.	12.
13	222.	207.	15.	13.
14	162.	155.	11.	14.
15	219.	209.	4.	15.
16	220.	210.	6.	16.
17	200.	176.	11.	17.
18	107.	171.	8.	18.
19	201.	185.	11.	19.
20	299.	205.	17.	20.

```
        21.   469.   435.   36.   21.
        22.   577.   438.  142.   22.
        23.   426.   419.   10.   23.
        24.   245.   221.   26.   24.
        25.   191.   177.   16.   25.
        26.   147.   128.   12.   26.
        27.   160.   165.   12.   27.
        28.   165.   147.   16.   28.
        29.   121.   117.    7.   29.
        30.   171.   150.   17.   30.
        31.   152.   126.   25.   31.
        32.   184.   174.   14.   32.
        33.   283.   263.   24.   33.
        34.   313.   274.   37.   34.
        35.   193.   162.   27.   35.
        36.   361.   336.   18.   36.
        37.   345.   336.   15.   37.
        38.   287.   191.   17.   38.
        39.   206.   191.   18.   39.
        40.   250.   166.   92.   40.
        41.   185.   171.   12.   41.
        42.   139.   124.   10.   42.
        43.   140.   135.   12.   43.
```

1RETIREMENT PROJECTIONS, 2ND MONTH

1RETIREMENT PROJECTIONS, 2ND MONTH   10/14/82   20.27.27.   PAGE   3

FILE   NONAME   (CREATION DATE = 10/14/82)   10/14/82   20.27.27.   PAGE   4
* * * * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	258.4186	121.9985	43
VOL	228.0837	98.0180	43
MAND	26.1628	36.2819	43
TIME	22.0000	12.5565	43

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND
VOL	.96766		
MAND	.74347	.55707	
TIME	-.22700	-.21707	-.05586

1RETIREMENT PROJECTIONS, 2ND MONTH   10/14/82   20.27.27.   PAGE   5

FILE   NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * *
5DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   258.41860   STD. DEV.   121.99848

VARIABLE(S) ENTERED ON STEP NUMBER   1.. VOL

253

MULTIPLE R .96766
R SQUARE .93637
ADJUSTED R SQUARE .93481
STD DEVIATION 31.14598

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F SIGNIFICANC
REGRESSION	1.	585257.72142	585257.72142	603.31685
RESIDUAL	41.	39772.74378	970.06692
COEFF OF VARIABILITY	12.1 PCT		

------- VARIABLES IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY
VOL	1.204323B	.49300943E-01	603.31685	.967668 .196668
			.B
(CONSTANT)	-17.231319	12.186124	1.9994284
			.165

------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
MAND	.97579	.68968	796.36262 .1735#6#7
TIME	-.86572	.95253	.679

* *

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R .99848
R SQUARE .99696
ADJUSTED R SQUARE .99680
STD DEVIATION 6.89557

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F SIGNIFICANC
REGRESSION	2.	623128.28811	311564.14486	6651.73821
RESIDUAL	40.	1902.17781	47.55443	.80
COEFF OF VARIABILITY	2.7 PCT		

------- VARIABLES IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY
VOL	.99082566	.13872815E-81	5838.4865	.8825456 .88467
MAND	.99658346	.35314921E-01	796.36262	.2963998 .18978
(CONSTANT)	3.7302655	2.7984924	1.7767788
			.198

------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
TIME	-.6577B	.9465B	29.737385 .88B

IRETIREMENT PROJECTIONS, 2ND MONTH | 10/14/82 | 20.27.27. PAGE 6

FILE NONAME (CREATION DATE = 10/14/82)
* * * * * * * * * * * * M U L T I P L E R E G R E S S I O N * * * * * * * * * * * * * * *
DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R .99914
R SQUARE .99827
ADJUSTED R SQUARE .99814

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F SIGNIFI...
REGRESSION	3.	623951.18278	207983.78898	7514.95981
RESIDUAL	39.	1079.36242	27.67596

STD DEVIATION   5.26079   COEFF OF VARIABILITY   2.0 PCT

---------------- VARIABLES IN THE EQUATION ----------------   ------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	.9862958	.10233745E-01	9288.4764	.7924773					
MAND	1.0093114	.27026751E-01	1391.0797	.2998879					
TIME	-.36232294	.6645#103E-01	29.730300	.102200					
(CONSTANT)	14.262592	2.0790722	24.640974	-.0372941					

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
VOL	.9862958	.10233745E-01	96.376742	.9655953	1.0069947
MAND	1.0093114	.27026751E-01	37.307904	.9536466	1.0629782
TIME	-.36232294	.6645#103E-01	-5.4525499	-.4967311	-.22791476
CONSTANT	14.262592	2.8790722	4.9530847	8.4391185	20.086065

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MAND	TIME
VOL	.00010		
MAND	-.00015	.00073	
TIME	.00015	-.00014	.00442

IRETIREMENT PROJECTIONS, 2ND MONTH

FILE NONAME   (CREATION DATE = 10/14/02)   10/14/82   20.27.27.   PAGE   7

* * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * *
0DEPENDENT VARIABLE...   ACCOMP   VOL,MAND,TIME

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL	603.31605	0	.96766	.93637	.93637	.96766	603.31685	0
2	MAND	796.36262	0	.99840	.99696	.06059	.74347	6551.73021	.000
3	TIME	29.73030	.000	.99914	.99827	.00132	-.22780	7514.95901	0

IRETIREMENT PROJECTIONS, 2ND MONTH   10/14/82   20.27.27.   PAGE   8

FILE NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * *

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL
1.	282.0000	272.5517	9.448253
2.	171.0000	165.7356	5.264390
3.	260.0000	254.9940	5.005963
4.	184.0000	194.4457	-10.44570
5.	214.0000	214.1395	-.1395/4
6.	204.0000	196.9221	7.877090
7.	228.0000	226.3468	1.653204
8.	360.0000	365.3163	-5.316269
9.	697.0000	691.0611	5.938906
10.	456.0000	457.4134	-.5865619
11.	408.0000	407.1860	.8140463
12.	242.0000	276.5666	5.433363
13.	222.0000	224.0401	-6.840136
14.	162.0000	173.1572	-11.15723
15.	219.0000	218.9967	.3345041E-02
16.	220.0000	221.6377	-1.637250
17.	200.0000	192.7825	7.21/547
18.	187.0000	184.4637	2.536279
19.	201.0000	200.9345	.6553759E-01
20.	299.0000	305.2515	-6.251511
21.	469.0000	471.9914	-2.991360
22.	577.0000	581.4609	-4.460934
23.	426.0000	429.2699	-3.269897
24.	245.0000	240.7541	4.754140
25.	191.0000	195.9117	-4.911722
26.	147.0000	143.1077	3.012304
27.	184.0000	179.3103	.6017103
28.	165.0000	165.7349	-.235901B
29.	121.0000	126.2499	-5.249925
30.	171.0000	168.4705	2.521548
31.	152.0000	152.5115	-.5115402
32.	104.0000	108.4004	-4.399953
33.	283.0000	205.9019	-2.901402
34.	313.0000	309.4960	3.504027
35.	193.0000	188.5845	4.414540
36.	365.0000	354.7637	10.23630
37.	345.0000	347.3764	-2.376445
38.	207.0000	206.6100	.9820347
39.	206.0000	206.6640	-.6689530
40.	250.0000	256.2593	-6.259301
41.	185.0000	184.1635	.8346461
42.	139.0000	136.3602	2.639798
43.	148.0000	143.9323	4.067730

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   43.
NUMBER OF 2 S.D. OUTLIERS   1.   OR   2.33 PERCENT OF THE TOTAL
(RETIREMENT PROJECTIONS, 2ND MONTH

FILE NONAME   (CREATION DATE = 10/14/82)

*** *** *** *** *** *** *** ** MULTIPLE REGRESSION ** *** *** *** *** *** *** ***   10/14/82   28.27.27.   PAGE   9

VON NEUMANN RATIO 1.65416	DURBIN-WATSON TEST 1.61569	EXPECTED NUMBER OF RUNS OF SIGNS 22.
		EXPECTED S.D. OF RUN DISTRIBUTION 3.22338
		UNIT NORMAL DEVIATE-
NUMBER OF POSITIVE RESIDUALS 23.		Z-(EXPECTED-OBSERVED)/S.D. -.89826
NUMBER OF NEGATIVE RESIDUALS 20.		PROBABILITY OF OBTAINING .GE. ABS(Z) .18452
NUMBER OF RUNS OF SIGNS 19.		

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S S -- STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

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RUN NAME        RETIREMENT PROJECTIONS, 3RD MONTH
VARIABLE LIST   ACCOMP,VOL,MAND,TIME
INPUT MEDIUM    DISK
N OF CASES      42
INPUT FORMAT    FREEFIELD
VAR LABELS      ACCOMP,VOL,MAND,TIME
LIST CASES      CASES=42/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION      METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS      ALL
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80054400 CM NEEDED FOR REGRESSION

OPTION - 1 ,
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 3RD MONTH

FILE NONAME (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	171.	129.	12.	1.
2	260.	218.	6.	2.
3	184.	155.	5.	3.
4	218.	157.	20.	4.
5	204.	150.	13.	5.
6	220.	169.	24.	6.
7	368.	292.	36.	7.
8	697.	435.	200.	8.
9	458.	385.	41.	9.
10	408.	351.	16.	10.
11	202.	225.	12.	11.
12	272.	194.	13.	12.
13	162.	130.	10.	13.
14	219.	201.	3.	14.
15	220.	190.	6.	15.
16	200.	157.	10.	16.
17	187.	168.	6.	17.
18	201.	175.	9.	18.
19	299.	271.	14.	19.
20	463.	411.	30.	20.

21.	577.	409.
22.	426.	307.
23.	245.	204.
24.	191.	161.
25.	147.	117.
26.	180.	152.
27.	165.	144.
28.	121.	114.
29.	171.	145.
30.	152.	121.
31.	184.	163.
32.	203.	249.
33.	313.	264.
34.	193.	157.
35.	361.	324.
36.	345.	320.
37.	207.	180.
38.	216.	179.
39.	250.	153.
40.	185.	158.
41.	139.	115.
42.	148.	126.

1RETIREMENT PROJECTIONS, 3RD MONTH

1RETIREMENT PROJECTIONS, 3RD MONTH

FILE   NONAME   (CREATION DATE = 10/14/82)   * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	257.8571	123.4130	42
VOL	211.4286	92.1086	42
MAND	24.4762	36.7578	42
TIME	21.5000	12.2678	42

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.95803		
MAND	.74703	.54227	
TIME	-.22718	-.10007	-.06053
	ACCOMP	VOL	MAND

1RETIREMENT PROJECTIONS, 3RD MONTH

FILE   NONAME   (CREATION DATE = 10/14/82)   * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * *
0DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   257.05714   STD. DEV.   123.41296

VARIABLE(S) ENTERED ON STEP NUMBER   1..   VOL

MULTIPLE R   .95803   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANC

R SQUARE   .9193B   REGRESSION   1.   574186.68839   574186.68839   456.85235   .88

ADJUSTED R SQUARE .91735   RESIDUAL   48.   58384.45447   1258.86136

STD DEVIATION   35.48844   COEFF OF VARIABILITY 13.8 PCT

----------- VARIABLES IN THE EQUATION -----------   ---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	1.2835924	.68186271E-81	456.85235 .888	.9508344		MAND	.95177	.78594	375.32575
(CONSTANT)	-13.53B965	13.837298	.95621368 .334	1.85247		TIME	-.18469	.96648	1.3773472 .248

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

MULTIPLE R   .99628   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANC

R SQUARE   .99241   REGRESSION   2.   619721.33673   389368.66836   2545.59879   .88

ADJUSTED R SQUARE .99282   RESIDUAL   39.   4739.88613   121.53349

STD DEVIATION   11.82422   COEFF OF VARIABILITY 4.3 PCT

----------- VARIABLES IN THE EQUATION -----------   ---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANC
VOL	1.B58B763	.22227718E-81	2231.7829 .8	.7843995		TIME	-.71797	.96514	48.427625 .888
MAND	1.B088884	.55747180E-81	375.32575 .8	.861888					
(CONSTANT)	9.4B65269	4.4593112	4.4493112 .841	.3216737					
				.18232					

IRETIREMENT PROJECTIONS, 3RD MONTH   18/14/82   25.26.48.   PAGE   6

FILE NONAME (CREATION DATE - 18/14/82)
* M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
#DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

MULTIPLE R   .99816   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANC

R SQUARE   .99632   REGRESSION   3.   622164.59786   287388.19982   3431.56735   .88

ADJUSTED R SQUARE .99683   RESIDUAL   38.   2296.54588   68.43542

STD DEVIATION   7.77442   COEFF OF VARIABILITY 3.8 PCT

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--------------- VARIABLES IN THE EQUATION ---------------        -------- VARIABLES NOT IN THE EQUATION --------

                                            F               BETA                                         F
VARIABLE     B         STD ERROR B     SIGNIFICANCE     ELASTICITY     VARIABLE   PARTIAL   TOLERANCE   SIGNIFICANCE

VOL        1.0324587    .15917478E-01    4207.2362       .7712393
MAND       1.0893191    .39338865E-01     766.77265       .84656
                                          .000            .3244468
TIME       -.64051380   .10073700        40.427625        .10340
                                          .000           -.0636702
(CONSTANT) 26.674530    4.1551115        41.212427       -.05341
                                          .000

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE     B         STD ERROR B        T          95.0 PCT CONFIDENCE INTERVAL

VOL        1.0324587    .15917478E-01    64.863211    1.0002355  :  1.0646820
MAND       1.0893191    .39338065E-01    27.698660    1.0096018  :  1.1689565
TIME       -.64051300   .10073700       -6.3502722   -.8444536   : -.43650223
CONSTANT   26.674530    4.1551115         6.4196906   18.262946  : 35.086113

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

         .00025
VOL
MAND    -.00034     .00155
TIME     .00028    -.00015     .01015

           VOL       MAND       TIME

IRETIREMENT PROJECTIONS, 3RD MONTH                                        10/14/82     20.26.48.      PAGE   7

FILE  NONAME   (CREATION DATE = 10/14/82 )
* * * * * * * * * * * * * * * *  M U L T I P L E   R E G R E S S I O N  * * * * * * * * * * * * * * * * * * * *
$DEPENDENT VARIABLE...   ACCOMP   VOL,MAND,TIME

                                        S U M M A R Y   T A B L E

STEP   VARIABLE   VARIABLE      F TO
       ENTERED    REMOVED   ENTER OR REMOVE  SIGNIFICANCE  MULTIPLE R  R SQUARE  R SQUARE  SIMPLE R  OVERALL F   SIGNIFICANCE
                                                                                 CHANGE
 1     VOL                    456.05235          .000        .95883     .91936    .91936    .95883    456.05235     .000
 2     MAND                   375.32575          0           .99620     .99241    .07305    .74703   2549.59079     .000
 3     TIME                    40.42763          .000        .99816     .99632    .00391   -.22710   3431.56735     .000
IRETIREMENT PROJECTIONS, 3RD MONTH                                       10/14/82     20.26.48.     PAGE   8

FILE  NONAME   (CREATION DATE = 10/14/82 )
* * * * * * * * * * * * * * *  M U L T I P L E   R E G R E S S I O N  * * * * * * * * * * * * * * * * * * * *
```

260

			RESIDUAL	-2SD	0.0	+2S
OBSERVATION	Y VALUE	Y ESTIMATE				
1.	171.0000	172.2930	-1.293023
2.	200.0000	257.0054	2.994577
3.	184.0000	190.2307	-6.230689
4.	210.0000	207.9949	2.005120
5.	204.0000	192.5019	11.49808
6.	228.0000	223.4686	4.519366
7.	304.0000	306.0044	-2.004375
8.	697.0000	688.5338	8.466199
9.	458.0000	463.0606	-5.060606
10.	408.0000	400.0915	7.908484
11.	282.0000	265.0039	16.99608
12.	222.0000	229.3167	-7.316674
13.	162.0000	171.7203	-9.720348
14.	219.0000	228.4995	-9.499401
15.	220.0000	219.7699	.230914
16.	210.0000	109.4155	18.50440
17.	187.0000	187.5151	-1.511088
18.	241.0000	245.6294	-4.629434
19.	299.0000	309.5516	-10.5155
20.	469.0000	470.0844	-1.08431
21.	577.0000	580.8906	-3.890555
22.	426.0000	420.8593	5.140688
23.	245.0000	251.9759	-6.975913
24.	191.0000	192.7785	-1.778524
25.	147.0000	143.4419	3.558132
26.	180.0000	178.9374	1.062598
27.	165.0000	173.3052	-8.305184
28.	121.0000	130.7977	-9.79717
29.	171.0000	171.9673	-.9672961
30.	152.0000	155.2623	-3.262326
31.	184.0000	185.0838	-1.083831
32.	283.0000	285.0467	-2.046698
33.	313.0000	326.0367	-13.03672
34.	193.0000	181.4305	11.56147
35.	361.0000	349.8938	11.10619
36.	347.0000	353.6146	-6.616575
37.	207.0000	202.9792	4.020758
38.	206.0000	211.1101	-5.110141
39.	250.0000	255.5200	-5.520764
40.	185.0000	173.9063	11.09367
41.	139.0000	127.8680	11.13923
42.	148.0000	141.8453	6.154730

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   42.
NUMBER OF 2 S.D. OUTLIERS   1.   OR   2.38 PERCENT OF THE TOTAL
(RETIREMENT PROJECTIONS, 3RD MONTH

FILE NONAME   (CREATION DATE = 10/14/82)
*** . . . . M U L T I P L E   R E G R E S S I O N ***** . . . .   10/14/82   20.26.48.   PAGE   9

VON NEUMANN RATIO   1.83164   DURBIN-WATSON TEST   1.78863

NUMBER OF POSITIVE RESIDUALS   18.
NUMBER OF NEGATIVE RESIDUALS   24.
NUMBER OF RUNS OF SIGNS   20.

EXPECTED NUMBER OF RUNS OF SIGNS   22.

EXPECTED S.D. OF RUN DISTRIBUTION   3.13366
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   -.34191
PROBABILITY OF OBTAINING .GE. ABS(Z)   .36621

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10/14/82   20.23.37.   PAGE   1

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RUN NAME        RETIREMENT PROJECTIONS, 4TH MONTH
VARIABLE LIST   ACCOMP,VOL,MAND,TIME
INPUT MEDIUM    DISK
N OF CASES      41
INPUT FORMAT    FREEFIELD
VAR LABELS      ACCOMP,VOL,MAND,TIME
LIST CASES      CASES=41/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION      METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/
STATISTICS      ALL
```

0005448# CM NEEDED FOR REGRESSION

```
OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
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10/14/82   20.23.37.   PAGE   2

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME   (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	260.	184.	6.	1.
2	184.	122.	5.	2.
3	219.	126.	20.	3.
4	204.	112.	10.	4.
5	228.	142.	19.	5.
6	304.	197.	27.	6.
7	697.	364.	202.	7.
8	458.	289.	44.	8.
9	408.	275.	16.	9.
10	282.	189.	13.	10.
11	222.	154.	15.	11.
12	162.	110.	10.	12.
13	219.	170.	4.	13.
14	228.	158.	5.	14.
15	240.	114.	10.	15.
16	187.	135.	6.	16.
17	201.	137.	9.	17.
18	299.	225.	10.	18.
19	469.	336.	25.	19.
20	577.	342.	143.	20.

21	426.	317.	9.	21.
22	245.	163.	26.	22.
23	191.	130.	14.	23.
24	147.	99.	13.	24.
25	180.	124.	11.	25.
26	165.	124.	14.	26.
27	121.	93.	4.	27.
28	171.	121.	13.	28.
29	152.	102.	22.	29.
30	164.	137.	12.	30.
31	283.	224.	28.	31.
32	313.	230.	46.	32.
33	193.	148.	21.	33.
34	361.	271.	8.	34.
35	345.	264.	18.	35.
36	207.	156.	13.	36.
37	206.	147.	28.	37.
38	258.	128.	94.	38.
39	105.	127.	9.	39.
40	139.	90.	7.	40.
41	148.	108.	11.	41.

IRETIREMENT PROJECTIONS, 4TH MONTH   10/14/82   20.23.37.   PAGE   3

IRETIREMENT PROJECTIONS, 4TH MONTH   10/14/82   20.23.37.   PAGE   4

FILE NONAME (CREATION DATE = 10/14/82) * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	259.9756	124.1705	41
VOL	175.4146	75.3137	41
MAND	24.4878	37.0286	41
TIME	21.0000	11.9791	41

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND
VOL	.95380		
MAND	-.72971	.54598	
TIME	-.26759	-.16598	-.07155

IRETIREMENT PROJECTIONS, 4TH MONTH   10/14/82   20.23.37.   PAGE   5

FILE NONAME (CREATION DATE = 10/14/82) * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * *
SDEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   259.97561   STD. DEV.   124.17058

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
.95388						

263

R SQUARE   .98988   REGRESSION   1.   561183.97656   561183.97656   393.76393

ADJUSTED R SQUARE   .98757   RESIDUAL   56570.99985   1425.10254
STD DEVIATION   37.75053   COEFF OF VARIABILITY   33.   PCT
                                                         14.5 PCT

------------------ VARIABLES IN THE EQUATION ------------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
			SIGNIFICANCE							SIGNIFICANCE
VOL	1.5726686	.79253647E-01	393.76393	.9538771		MAND	.83098	.78288	84.738984	.000
(CONSTANT)	-15.893480	15.180788	1.1077553	1.06113		TIME	-.36908	.97245	5.9925529	.019
			.299							

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2..   MAND

MULTIPLE R   .98595   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANC
R SQUARE   .97218   REGRESSION   2.   599525.71279   299762.85639   661.98725   .00
ADJUSTED R SQUARE .97063   RESIDUAL   38.   17287.26282   452.82271
STD DEVIATION   21.27963   COEFF OF VARIABILITY   8.2 PCT

------------------ VARIABLES IN THE EQUATION ------------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
			SIGNIFICANCE							SIGNIFICANCE
VOL	1.3047248	.53320325E-01	598.75856	.7913596		TIME	-.69794	.97193	35.141828	.0
MAND	.97728985	.10615632	84.738904	.80034						
(CONSTANT)	7.1782298	8.8734433	.65440086	.2977874						
			.474	.09205						

IRETIREMENT PROJECTIONS, 4TH MONTH   10/14/82   20.23.37.   PAGE   6

FILE   NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3..   TIME

MULTIPLE R   .99282   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANC
R SQUARE   .98569   REGRESSION   3.   607907.63981   202635.87994   849.54587
ADJUSTED R SQUARE .98453   RESIDUAL   37.   8825.33579   238.52259
STD DEVIATION   15.44410   COEFF OF VARIABILITY   5.9 PCT

--------------- VARIABLES IN THE EQUATION --------------- ·· --------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	1.2694742	.39152625E-01	1051.2984		.7699794					
MAND	.98774587	.77865865E-01	164.27305	0	.85656 .3609175					
TIME	-1.2257392	.28677168	35.141028	0	.09304 -.102512					
(CONSTANT)	38.844848	8.3671523	21.552299	000	-.09901					

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
VOL	1.2694742	.39152625E-01	32.423732	1.1901435	1.3488850
MAND	.98774587	.77865065E-01	12.816985	.83159559	1.1430961
TIME	-1.2257392	.28677168	-5.9279062	-1.6446983	-.88670013
CONSTANT	38.844848	8.3671523	4.6424454	21.898586	55.797589

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MAND	TIME
VOL	-.00153		
MAND	-.00164	.00594	
TIME	.00123	-.00037	.04275

RETIREMENT PROJECTIONS, 4TH MONTH   10/14/82   20.23.37.   PAGE 7

FILE NONAME   (CREATION DATE = 10/14/82)
0 .. .. M U L T I P L E   R E G R E S S I O N .. ..
0 DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		393.76393	0	.95388	.90988	.90988	.95388	393.76393	0
2	MAND		84.73898	.000	.98595	.97218	.06222	.72971	661.90725	.000
3	TIME		35.14102	0	.99202	.90569	.01369	-.26759	849.54587	0

RETIREMENT PROJECTIONS, 4TH MONTH   PAGE 8

FILE NONAME   (CREATION DATE = 10/14/82)   10/14/82   20.23.37.
0 .. .. M U L T I P L E   R E G R E S S I O N .. ..

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2S

265

	Observed	Estimate	Residual
1.	265.0000	277.1280	-17.1280
2.	184.0000	196.2072	-12.2072
3.	219.0000	214.8755	-4.8755
4.	204.0000	185.9997	18.0003
5.	228.0000	231.7479	-3.7479
6.	360.0000	308.2452	51.7548
7.	697.0000	691.8772	5.1228
8.	458.0000	439.3778	18.6230
9.	408.0000	392.7217	15.2782
10.	282.0000	279.3580	2.6420
11.	222.0000	235.6761	-13.6761
12.	162.0000	173.6548	-11.6548
13.	219.0000	242.6718	-23.6718
14.	220.0000	227.1994	-7.1993
15.	200.0000	175.0555	24.9445
16.	187.0000	196.5377	-9.5377
17.	281.0000	280.8142	.1858
18.	299.0000	317.2099	-13.2099
19.	469.0000	466.7970	2.2008
20.	577.0000	509.7371	-12.7371
21.	426.0000	424.4166	1.5834
22.	245.0000	244.4835	.5165
23.	191.0000	189.5121	1.4070
24.	147.0000	147.9458	-.9449
25.	180.0000	176.4006	3.5194
26.	165.0000	178.2181	-13.2180
27.	121.0000	127.7612	-6.7611
28.	171.0000	176.9744	-.2957 E-01
29.	152.0000	154.5144	-2.5143
30.	184.0000	187.8428	-3.8427
31.	283.0000	304.9633	-21.9632
32.	313.0000	337.0350	-24.0357
33.	193.0000	207.0195	-14.0195
34.	361.0000	349.0904	11.9016
35.	345.0000	348.8630	-3.8637
36.	207.0000	205.5961	1.4038
37.	206.0000	199.0593	6.1467
38.	258.0000	247.6460	2.3932
39.	185.0000	161.1532	23.0468
40.	139.0000	121.1372	17.8620
41.	148.0000	136.5572	11.4428

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   41.
NUMBER OF 2 S.D. OUTLIERS   1. OR 2.44 PERCENT OF THE TOTAL
1RETIREMENT PROJECTIONS, 4TH MONTH   10/14/82   20.23.37.   PAGE   9

FILE   NONAME   (CREATION DATE = 10/14/82).   M U L T I P L E   R E G R E S S I O N

VON NEUMANN RATIO   1.49762   DURBIN-WATSON TEST   1.46109

NUMBER OF POSITIVE RESIDUALS   21.
NUMBER OF NEGATIVE RESIDUALS   20.
NUMBER OF RUNS OF SIGNS   20.

EXPECTED NUMBER OF RUNS OF SIGNS   21.
EXPECTED S.D. OF RUN DISTRIBUTION   3.15936
UNIT NORMAL DEVIATE-

Z=(EXPECTED-OBSERVED)/S.D.   -.31266
PROBABILITY OF OBTAINING .GE. ABS(Z)   .37727

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VERSION 8.0 -- JUNE 18, 1979

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RUN NAME        RETIREMENT PROJECTIONS, 5TH MONTH
VARIABLE LIST   ACCOMP,VOL,MAND,TIME
INPUT MEDIUM    DISK
N OF CASES      40
INPUT FORMAT    FREEFIELD
VAR LABELS      ACCOMP,VOL,MAND,TIME
LIST CASES      CASES=40/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION      METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS      ALL
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98854889 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 5TH MONTH

FILE NONAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	184.	94.	5.	1.
2	218.	91.	13.	2.
3	204.	84.	10.	3.
4	236.	91.	17.	4.
5	368.	156.	16.	5.
6	647.	271.	212.	6.
7	458.	218.	46.	7.
8	480.	205.	16.	8.
9	242.	145.	13.	9.
10	222.	135.	16.	10.
11	162.	83.	10.	11.
12	219.	136.	4.	12.
13	274.	117.	10.	13.
14	204.	97.	6.	14.
15	187.	91.	10.	15.
16	281.	95.	6.	16.
17	299.	166.	17.	17.
18	469.	208.	150.	18.
19	577.	255.	10.	19.
20	426.	256.	10.	20.

21	245.	131.	27.
22	191.	95.	14.
23	147.	77.	13.
24	188.	98.	11.
25	165.	99.	14.
26	121.	74.	4.
27	171.	79.	13.
28	152.	72.	22.
29	134.	184.	12.
30	283.	185.	21.
31	313.	171.	47.
32	193.	128.	21.
33	361.	212.	15.
34	345.	285.	15.
35	287.	128.	13.
36	286.	118.	16.
37	258.	187.	97.
38	185.	185.	7.
39	139.	77.	11.
40	148.	84.	

1RETIREMENT PROJECTIONS, 5TH MONTH   1#/14/82   2#.29.23.   PAGE   3

1RETIREMENT PROJECTIONS, 5TH MONTH   1#/14/82   2#.29.23.   PAGE   4

FILE   NONAME   (CREATION DATE = 1#/14/82)   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	259.975#	125.7524	4#
VOL	134.#5##	57.86#1	4#
MAND	25.#5.##	4#.1452	4#
TIME	2#.5###	11.69#5	4#

CORRELATION COEFFICIENTS.

A VALUE OF 99.#### IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	.89827	.4263#	-.#8485
VOL	.72#86		
MAND	-.27/G#	-.1#97#	
TIME			
	ACCOMP	VOL	MAND

1RETIREMENT PROJECTIONS, 5TH MONTH   1#/14/82   2#.29.23.   PAGE   5

FILE   NONAME   (CREATION DATE = 1#/14/82)   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * *
  #DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   259.975##   STD. DEV.   125.7524#

VARIACLE(S) ENTERED ON STEP NUMBER   1..   VOL

MULTIPLE R	.89827	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.8#689	REGRESSION	1.	497637.17565	497637.17565	158.78153	

ADJUSTED R SQUARE .98181 RESIDUAL 38. PCT 119895.79935
STD DEVIATION 55.98393 COEFF OF VARIABILITY 21.5 PCT 3134.89998

------------ VARIABLES IN THE EQUATION ------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	1.9522916	.15493327	158.78153	.8982719		MAND	.85013	.81827	96.436878
(CONSTANT)	-1.6320739	22.569317	.52292912E-02	1.05628		TIME	-.41012	.98796	7.4017997
			.943						.010

* *

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R	.97286	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.94645	REGRESSION	2.	58370.53620	29185.76810	326.99885	.00
ADJUSTED R SQUARE	.94356	RESIDUAL	37.	33023.43080	892.52537		
STD DEVIATION	29.87516	COEFF OF VARIABILITY	11.5 PCT				

------------ VARIABLES IN THE EQUATION ------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	1.5696577	.91480789E-01	294.92393	.7222176		TIME	-.71110	.98619	36.825168
MAND	1.2936510	.13173329	96.436878	.809906					.000
(CONSTANT)	17.234913	12.196315	1.9969210	.4129054					
			.166	.12465					

RETIREMENT PROJECTIONS, 5TH MONTH   10/14/82   20.29.23.   PAGE 6

FILE NONAME (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R	.98668	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.97353	REGRESSION	3.	60408.34484	20136.11475	441.35151	.00
ADJUSTED R SQUARE	.97132	RESIDUAL	36.	16324.63016	453.46195		
STD DEVIATION	21.29465	COEFF OF VARIABILITY	8.2 PCT				

```
-------------------- VARIABLES IN THE EQUATION --------------------        -------- VARIABLES NOT IN THE EQUATION ----------

                                                                                                                    F
VARIABLE          B          STD ERROR B          F          BETA          VARIABLE     PARTIAL     TOLERANCE     SIGNIFICANCE
                                                SIGNIFICANCE   ELASTICITY

VOL            1.5372954      .65367255E-01     553.00700      .7073274
MAND           1.2694957      .93982193E-01     182.46153      .79237
TIME          -1.7823716      .29371486          36.82516R     .12232
(CONSTANT)    58.715171      11.058875           28.188942    -.1656965
                                                               -.14855
```

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

```
VARIABLE          B          STD ERROR B          T          95.0 PCT CONFIDENCE INTERVAL

VOL            1.5372954      .65367255E-01     23.517820     1.4047244  :  1.6698663
MAND           1.2694957      .93982193E-01     13.507832     1.0788910  :  1.4601004
TIME          -1.7823716      .29371406         -6.0683737   -2.3700529  : -1.1866902
CONSTANT      58.715171      11.058875           5.3093268   36.286733  : 81.143608
```

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

```
VOL       .00427
MAND     -.00259      .00883
TIME      .00157      .00117      .8627

           VOL        MAND        TIME
```

RETIREMENT PROJECTIONS, 5TH MONTH   10/14/82   20.29.23.   PAGE   7

FILE   NONAME   (CREATION DATE = 10/14/82)
*•••••••••••••••••••••• MULTIPLE REGRESSION ••••••••••••••••••••••••••••••••
DEPENDENT VARIABLE.   ACCOMP   VOL,MAND,TIME

SUMMARY TABLE

```
       VARIABLE               F TO
STEP   ENTERED  REMOVED   ENTER OR REMOVE   SIGNIFICANCE   MULTIPLE R   R SQUARE   R SQUARE   SIMPLE R   OVERALL F   SIGNIFICANCE
                                                                                  CHANGE

1      VOL                   158.78153           0         .89027       .80609     .80609     .89027     158.78153      0
2      MAND                   96.43608           0         .97286       .94645     .13956     .72006     326.99005      .000
3      TIME                   36.02516         .000        .98660       .97353     .02740    -.27768     441.35151      .000
RETIREMENT PROJECTIONS, 5TH MONTH                                         10/14/82    20.29.23.    PAGE   8
```

FILE   NONAME   (CREATION DATE = 10/14/82)
*•••••••••••••••••••••• MULTIPLE REGRESSION ••••••••••••••••••••••••••••••••

```
OBSERVATION   Y VALUE   Y ESTIMATE   RESIDUAL        -2SD             0.0              +2S
0
```

1.	184.0000	207.7864	-23.78664
2.	210.0000	219.1647	-9.164724
3.	204.0000	195.1958	8.804176
4.	228.0000	213.0610	14.93901
5.	360.0000	309.9333	50.06668
6.	697.0000	667.6574	29.34263
7.	458.0000	439.7658	18.23424
8.	408.0000	379.9137	28.08632
9.	282.0000	282.0851	-.85099968E-01
10.	222.0000	268.7383	-46.73826
11.	162.0000	179.3996	-17.39956
12.	219.0000	251.4769	-32.47686
13.	220.0000	215.3384	4.661694
14.	200.0000	195.5746	4.425423
15.	187.0000	191.7088	-4.768813
16.	201.0000	188.9352	12.06476
17.	299.0000	291.2229	7.777149
18.	461.0000	470.6566	-9.656613
19.	577.0000	607.2048	-30.00478
20.	426.0000	429.3103	-3.310311
21.	245.0000	256.9474	-11.94744
22.	191.0000	183.3198	7.601004
23.	147.0000	152.5958	-5.595812
24.	100.0000	100.5577	-.55/6578
25.	165.0000	104.1211	-19.12146
26.	121.0000	131.2114	-10.21135
27.	171.0000	148.5409	22.45908
28.	152.0000	147.4279	4.577061
29.	104.0000	102.1391	1.060930
30.	283.0000	316.3431	-33.34318
31.	313.0000	326.0455	-13.00546
32.	193.0000	225.1125	-32.11259
33.	361.0000	344.8460	16.15404
34.	345.0000	332.3025	12.69748
35.	207.0000	209.6094	-2.609417
36.	206.0000	103.9642	22.03578
37.	250.0000	269.6380	-19.63074
38.	185.0000	165.0960	19.90398
39.	139.0000	116.4609	22.5911
40.	140.0000	134.5176	17.40243

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   40.
NUMBER OF 2 S.D. OUTLIERS   2. OR 5.00 PERCENT OF THE TOTAL
IRETIREMENT PROJECTIONS, 5TH MONTH

FILE NONAME   (CREATION DATE - 10/14/82)
......*...*...*...* MULTIPLE REGRESSION *...*...*...*...*...*   10/14/82   20.29.23.   PAGE   9

VON NEUMANN RATIO   1.30367   DURBIN-WATSON TEST   1.27100

NUMBER OF POSITIVE RESIDUALS   20.
NUMBER OF NEGATIVE RESIDUALS   20.
NUMBER OF RUNS OF SIGNS   16.

EXPECTED NUMBER OF RUNS OF SIGNS   21.
EXPECTED S.D. OF RUN DISTRIBUTION   3.12147
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   -1.44163
PROBABILITY OF OBTAINING .GE. ABS(Z)   .07478

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```
RUN NAME           RETIREMENT PROJECTIONS, 6TH MONTH
VARIABLE LIST      ACCOMP,VOL,MAND,TIME
INPUT MEDIUM       DISK
N OF CASES         39
INPUT FORMAT       FREEFIELD
VAR LABELS         ACCOMP,VOL,MAND,TIME
LIST CASES         CASES=39/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION         METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                   REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                   REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS         ALL
```

00754480 CM NEEDED FOR REGRESSION

```
OPTION - 1,
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

1RETIREMENT PROJECTIONS, 6TH MONTH

FILE   NONAME   (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	210.	73.	20.	1.
2	204.	63.	10.	2.
3	228.	77.	18.	3.
4	304.	110.	13.	4.
5	617.	272.	234.	5.
6	4,0.	145.	40.	6.
7	400.	172.	17.	7.
8	282.	120.	15.	8.
9	222.	112.	17.	9.
10	162.	68.	10.	10.
11	219.	117.	4.	11.
12	220.	97.	6.	12.
13	200.	87.	10.	13.
14	187.	84.	7.	14.
15	201.	80.	10.	15.
16	299.	132.	7.	16.
17	469.	228.	11.	17.
18	677.	199.	167.	18.
19	426.	197.	12.	19.
20	245.	117.	29.	20.

21	191.	85.	17.	21.	
22	147.	64.	13.	22.	
23	180.	90.	11.	23.	
24	165.	84.	14.	24.	
25	171.	57.	4.	25.	
26	171.	68.	13.	26.	
27	152.	63.	21.	27.	
28	184.	79.	12.	28.	
29	203.	145.	21.	29.	
30	313.	131.	50.	30.	
31	193.	114.	21.	31.	
32	361.	143.	15.	32.	
33	345.	177.	20.	33.	
34	207.	107.	8.	34.	
35	206.	83.	16.	35.	
36	258.	84.	110.	36.	
37	165.	92.	10.	37.	
38	130.	68.	8.	38.	
39	140.	71.	13.	39.	

IRETIREMENT PROJECTIONS, 6TH MONTH   10/14/82   20.30.24.   PAGE   3

IRETIREMENT PROJECTIONS, 6TH MONTH   10/14/82   20.30.24.   PAGE   4

FILE NONAME   (CREATION DATE = 10/14/82)
0 . . . . M U L T I P L E   R E G R E S S I O N . . . .

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	261.9231	126.7834	39
VOL	111.8718	49.7807	39
MAND	27.2308	45.2158	39
TIME	20.0000	11.4018	39

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND
VOL	.93671		
MAND	.71017	.57601	
TIME	-.31749	-.18407	-.10674

IRETIREMENT PROJECTIONS, 6TH MONTH   10/14/82   20.30.24.   PAGE   5

FILE NONAME   (CREATION DATE = 10/14/82)
0 . . . . M U L T I P L E   R E G R E S S I O N . . . .
0DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   261.92380   STD. DEV.   126.78336

VARIABLE(S) ENTERED ON STEP NUMBER   1..   VOL

MULTIPLE R	.93671	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.87743	REGRESSION	1.	535946.97258	535946.97258	264.87447	

ADJUSTED R SQUARE .87412   RESIDUAL   2823.39991
STD DEVIATION   44.98222   COEFF OF VARIABILITY 37.2 PCT 74865.79668 17.2 PCT

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANC
VOL	2.3856592	.14658461	264.87447	.9367137		MAND	.59618	.66821	19.850748
(CONSTANT)	-4.9649838	17.918858	.768/8269E-81 .808 .783	1.81896		TIME	-.42158	.96612	7.7812831 .008

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

MULTIPLE R   .95969   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANCE
R SQUARE   .92188   REGRESSION   2.   562556.14288   281278.87148   289.83669   .88
ADJUSTED R SQUARE .91661   RESIDUAL   36.   48256.62643   1348.46185
STD DEVIATION   36.67232   COEFF OF VARIABILITY 14.8 PCT

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	2.8118855	.14595465	189.85638 .808	.7896397 .85897		TIME	-.52444	.96612	13.278494 .801
MAND	.71595365	.16869282	19.850748 .8818	.2553317 .87443					
(CONSTANT)	17.443369	15.421352	1.2794279 .265						

IRETIREMENT PROJECTIONS, 6TH MONTH   18/14/82   28.38.24.   PAGE 6

FILE NONAME   (CREATION DATE = 18/14/82)
* * * * * * * * * * * MULTIPLE REGRESSION *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

MULTIPLE R   .97894   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANC
R SQUARE   .94273   REGRESSION   3.   575820.62256   191942.87419   192.82985
ADJUSTED R SQUARE .93782   RESIDUAL   35.   34984.14667   999.54785
STD DEVIATION   31.61561   COEFF OF VARIABILITY 12.1 PCT

END

FILMED

DTIC

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

| ADJUSTED R SQUARE | .87412 | RESIDUAL | | | | 74865.79666 | 2023.39991 |
| STD DEVIATION | 44.98222 | COEFF OF VARIABILITY | 37.2 PCT | 17.2 PCT | | | |

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	2.385692	.1658461	.367137	264.87447 .000		MAND	.59610	.66821	19.855748	.000 .000
(CONSTANT)	-4.9649038	17.910858	1.01096	.7684259E-01 .783		TIME	-.42158	.96612	7.7812031	.000

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R	.95969	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.92100	REGRESSION	2.	562556.14280	281278.07140	209.83669	.00
ADJUSTED R SQUARE		RESIDUAL		48256.62643	1340.46185		
STD DEVIATION	36.61232	COEFF OF VARIABILITY	36.0	14.0 PCT			

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	2.0110055	.14595465	.7896397	189.85638 .000		TIME	-.52444	.96612	13.278494	.001
MAND	.71595365	.16069282	.85897 .2553317	19.855748 .000						
(CONSTANT)	17.443369	15.421352	.87443	1.2794279 .265						

RETIREMENT PROJECTIONS. 6TH MONTH   10/14/82   20.30.24.   PAGE 6

FILE NONAME (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * *
DEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R	.97094	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.94273	REGRESSION	3.	575828.62256	191942.87419	192.02985	
ADJUSTED R SQUARE	.93702	RESIDUAL		34984.14667	999.54705		
STD DEVIATION	31.61561	COEFF OF VARIABILITY	35.0	12.1 PCT			

275

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   39. OR   7.69 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   3.

VON NEUMANN RATIO   2.41654   DURBIN-WATSON TEST   2.36458

NUMBER OF POSITIVE RESIDUALS   19.
NUMBER OF NEGATIVE RESIDUALS   20.
NUMBER OF RUNS OF SIGNS   16.
RETIREMENT PROJECTIONS, 6TH MONTH

EXPECTED NUMBER OF RUNS OF SIGNS   20.
EXPECTED S.D. OF RUN DISTRIBUTION   3.07996
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   -1.29493
PROBABILITY OF OBTAINING .GE. ABS(Z)   .09767

10/14/82   20.30.24.   PAGE   9

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RUN NAME   RETIREMENT PROJECTIONS, 7TH MONTH
VARIABLE LIST   ACCOMP,VOL,MAND,TIME
INPUT MEDIUM   DISK
N OF CASES   36
INPUT FORMAT   FREEFIELD
VAR LABELS   ACCOMP,VOL,MAND,TIME
LIST CASES   CASES=36/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION   METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/

STATISTICS   ALL

00054400 CM NEEDED FOR REGRESSION

OPTION - 1.
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED..OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 7TH MONTH

FILE NONAME (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	284.	53.	10.	1.
2	228.	56.	19.	2.
3	360.	96.	14.	3.
4	450.	114.	51.	4.
5	400.	116.	22.	5.
6	787.	100.	15.	6.
7	222.	93.	19.	7.
8	162.	55.	18.	8.
9	215.	181.	4.	9.
10	228.	88.	6.	10.
11	200.	78.	5.	11.
12	187.	65.	7.	12.
13	201.	65.	10.	13.
14	293.	113.	7.	14.
15	469.	171.	11.	15.
16	426.	147.	14.	16.
17	245.	93.	29.	17.
18	191.	76.	17.	18.
19	147.	56.	16.	19.
20	198.	77.	11.	22.

```
21   169.   72.   14.   23.
22   121.   46.    4.   24.
23   171.   61.   14.   25.
24   152.   54.   19.   26.
25   184.   65.   14.   27.
26   203.  109.   21.   28.
27   313.  117.   51.   29.
28   193.   98.   25.   30.
29   361.   93.   16.   31.
30   345.  132.   21.   32.
31   207.   97.   12.   33.
32   205.   65.   15.   34.
33   250.   65.  115.   35.
34   185.   72.    3.   36.
35   139.   55.    8.   37.
36   148.   55.   22.   38.
```

1RETIREMENT PROJECTIONS, 7TH MONTH   10/14/82   20.31.46.   PAGE   3

1RETIREMENT PROJECTIONS, 7TH MONTH   10/14/82   20.31.46.   PAGE   4

FILE   NONAME   (CREATION DATE = 10/14/82)   * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	242.5278	93.5846	36
VOL	85.3611	29.8418	36
MAND	18.6389	19.6398	36
TIME	20.8058	11.1021	36

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

```
             ACCOMP    VOL      MAND
VOL          .85710
MAND         .23561   .86815
TIME        -.29097  -.13585   .20953
```

1RETIREMENT PROJECTIONS, 7TH MONTH   10/14/82   20.31.46.   PAGE   5

FILE   NONAME   (CREATION DATE = 10/14/82)   * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   242.52778   STD. DEV.   93.58462

VARIABLE(S) ENTERED ON STEP NUMBER   1..   VOL

MULTIPLE R	.85710	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.73462	REGRESSION	1.	224001.32592	224001.32592	94.11977	.00
ADJUSTED R SQUARE	.72682	RESIDUAL	34.	81207.64638	2388.46019		
STD DEVIATION	48.87188	COEFF OF VARIABILITY	20.2 PCT				

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	2.7596482	.20445482	.8571017	94.119771 .000		MAND	.3794	.99638	4.8494113 .035
(CONSTANT)	6.9611409	25.611159	.9713D	.73875829E-01 .787		TIME	-.3328	.98176	4.4001575 .043

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

MULTIPLE R	.87671		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.76862		REGRESSION	2.	235205.96092	117662.98001	54.81262	.00
ADJUSTED R SQUARE	.75460		RESIDUAL	33.	70803.01220	2145.54582		
STD DEVIATION	46.32804		COEFF OF VARIABILITY	19.1 PCT				

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	2.7230740	.27009104	.0459908	101.70766 .000		TIME	-.46335	.93422	8.7485252 .006
MAND	.87540533	.39937796	.95871 .1847203	4.8494113 .035					
(CONSTANT)	-6.3777640	25.010221	.06759	.64906650E-01 .000					

IRETIREMENT PROJECTIONS, 7TH MONTH   10/14/82   20.31.46.   PAGE   6

FILE NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * *
SDEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

MULTIPLE R	.90460		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.81830		REGRESSION	3.	250407.04052	83469.01617	48.03806	.00
ADJUSTED R SQUARE	.80127		RESIDUAL	32.	55601.92370	1737.56012		
STD DEVIATION	41.60405		COEFF OF VARIABILITY	17.2 PCT				

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	2.6138584	.24580864	113.00158	.8118193				
MAND	1.1192972	.36843751	9.2291808	.91998				
TIME	-1.9421867	.6566#723	.005	.2350986				
(CONSTANT)	37.386282	26.941024	.006	-.2305930				
			.175	-.16016				

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	2.6138584	.24580864	10.630228	2.1129916 : 3.1147892
MAND	1.1192972	.36843751	3.0379567	.36881454 : 1.8697798
TIME	-1.9421867	.6566#723	-2.9577906	-3.2795718 : -.64464152
CONSTANT	37.386282	26.941024	1.3877983	-17.498708 : 92.263352

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MAND	TIME
VOL	.06046		
MAND	-.00927	.13575	
TIME	.02442	-.05324	.43113

1RETIREMENT PROJECTIONS, 7TH MONTH
10/14/82   20.31.46.   PAGE   7
FILE NONAME   (CREATION DATE = 10/14/82)
0 . . . . M U L T I P L E   R E G R E S S I O N . . . .
0DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		94.11977	.000	.85710	.73462	.73462	.85710	94.11977	.000
2	MAND		4.84341	.035	.87671	.76862	.03400	.23561	54.81262	.000
3	TIME		8.74053	.006	.90460	.81830	.04968	-.23097	48.03806	.000

1RETIREMENT PROJECTIONS, 7TH MONTH   10/14/82   20.31.46.   PAGE   8
FILE NONAME   (CREATION DATE = 10/14/82)
0 . . . . M U L T I P L E   R E G R E S S I O N . . . .

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2S
					. . .	
1.	204.0000	185.1712	18.82878			
2.	228.0000	201.1443	26.85566			
3.	360.0000	298.1598	61.84024			

280

Case			
4.	450.0000	382.7388	75.26118
5.	400.0000	353.5640	64.43517
6.	282.0000	301.9668	-19.96603
7.	222.0000	286.2042	-64.20416
8.	162.0000	105.3175	-23.31747
9.	219.0000	286.4413	-67.44129
10.	220.0000	252.7577	-32.75773
11.	200.0000	223.5578	-23.55782
12.	107.0000	109.0743	-2.874251
13.	201.0000	191.2900	9.709964
14.	299.0000	311.4549	-12.45486
15.	469.0000	465.5933	3.486748
16.	426.0000	472.3345	23.66547
17.	245.0000	276.0340	-31.03306
18.	191.0000	216.2748	-25.27403
19.	147.0000	160.8064	-13.80642
20.	180.0000	200.2307	-24.23068
21.	165.0000	196.5052	-31.50522
22.	121.0000	115.4900	5.549972
23.	171.0000	163.9486	7.051351
24.	152.0000	149.3061	2.693924
25.	184.0000	170.5190	13.40016
26.	283.0000	291.4722	-8.427228
27.	313.0000	343.9698	-30.96904
28.	193.0000	263.2628	-74.26285
29.	361.0000	238.1778	122.8222
30.	345.0000	343.7724	1.227648
31.	207.0000	240.2718	-33.27182
32.	206.0000	158.0444	47.95561
33.	250.0000	268.0320	-18.03208
34.	185.0000	159.0256	25.97444
35.	139.0000	118.2445	20.75552
36.	148.0000	131.9725	16.02746

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   36.
NUMBER OF 2 S.D. OUTLIERS   1. OR   2.78 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.65849   DURBIN-WATSON TEST   1.61242

NUMBER OF POSITIVE RESIDUALS   18.
NUMBER OF NEGATIVE RESIDUALS   18.
NUMBER OF RUNS OF SIGNS   13.

EXPECTED NUMBER OF RUNS OF SIGNS   19.
EXPECTED S.D. OF RUN DISTRIBUTION   2.95683
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   -1.86818
PROBABILITY OF OBTAINING .GE. ABS(Z)   .03144

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

```
RUN NAME          RETIREMENT PROJECTIONS, 8TH MONTH
VARIABLE LIST     ACCOMP,VOL,MAND,TIME
INPUT MEDIUM      DISK
N OF CASES        34
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,VOL,MAND,TIME
LIST CASES        CASES=34/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                  REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                  REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
STATISTICS        ALL
```

800544800 CM NEEDED FOR REGRESSION

```
OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

RETIREMENT PROJECTIONS, 8TH MONTH

FILE NONAME   (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	228.	47.	19.	1.
2	360.	81.	15.	2.
3	458.	72.	52.	3.
4	408.	84.	23.	4.
5	282.	75.	15.	5.
6	222.	76.	19.	6.
7	162.	48.	10.	7.
8	219.	93.	7.	8.
9	228.	74.	9.	10.
10	240.	61.	6.	11.
11	187.	61.	5.	12.
12	201.	71.	10.	13.
13	299.	99.	7.	14.
14	469.	139.	11.	15.
15	426.	116.	17.	17.
16	245.	80.	31.	18.
17	191.	64.	18.	19.
18	147.	49.	10.	20.
19	180.	69.	11.	21.
20	165.	64.	15.	22.
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21    121.    48.    5.    23.
22    171.    47.    14.   24.
23    152.    48.    28.   25.
24    284.    68.    14.   26.
25    283.    96.    21.   27.
26    313.    94.    51.   28.
27    193.    76.    26.   29.
28    361.    72.    28.   38.
29    345.    188.   25.   31.
38    287.    85.    12.   32.
31    286.    54.    19.   33.
32    185.    61.    4.    35.
33    139.    36.    8.    36.
34    148.    46.    23.   37.
```

IRE ENT PROJECTIONS, 8TH MONTH   18/14/82   28.33.46.   PAGE 3

(I E) REMENT PROJECTIONS, 8TH MONTH   18/14/82   28.33.46.   PAGE 4

FILE NONAME (CREATION DATE = 18/14/82)   * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * *

VAR. LE	MEAN	STANDARD DEV	CASES
ACCOMP	246.3824	95.78444	34
VOL	71.7859	22.5866	34
MAND	17.8888	11.8454	34
TIME	19.1176	18.6288	34

CORRELATION COEFFICIENTS.

A VALUE OF 99.88888 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

```
VOL    .75365
MAND   .42518    .16653
TIME  -.31971   -.17115    .83872

       ACCOMP    VOL      MAND
```

RETIREMENT PROJECTIONS, 8TH MONTH   18/14/82   28.33.46.   PAGE 5

FILE NONAME (CREATION DATE = 18/14/82)   * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * *
DEPENDENT VARIABLE... ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   246.38235   STD. DEV.   95.78441

VARIABLE(S) ENTERED ON STEP NUMBER   1.. VOL

MULTIPLE R	.75365	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.56799	REGRESSION	1.	171679.88492	171679.88492	42.87286	.88
ADJUSTED R SQUARE	.55449	RESIDUAL	32.	138579.82449	4888.59452		
STD DEVIATION	63.87953	COEFF OF VARIABILITY	25.9 PCT				
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--------- VARIABLES IN THE EQUATION ---------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F	SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	3.1933850	.49232705	.7536499	42.072057	.000		MAND	.46226	.97227	8.4243484	.007
(CONSTANT)	17.397867	36.963568	.92939	.22153597	.641		TIME	-.29452	.97071	2.9444120	.096

* *

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

MULTIPLE R	.81259	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.66030	REGRESSION	2.	199581.63977	99790.81988	30.12079	.00
ADJUSTED R SQUARE	.63039	RESIDUAL	31.	102676.38964	3312.14160		
STD DEVIATION	57.55121	COEFF OF VARIABILITY	23.4 PCT				

--------- VARIABLES IN THE EQUATION ---------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F	SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	2.9759569	.44983650	.7023362	43.766806	.0		TIME	-.36459	.96710	4.6991847	.040
MAND	2.6698865	.9190616	.86611	8.4243484	.507						
			.3001348	.12660953							
(CONSTANT)	-12.399332	34.048213	.18422		.724						

IRETIREMENT PROJECTIONS, 8TH MONTH   10/14/82   20.33.46.   PAGE 6

FILE NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * *
SDEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

MULTIPLE R	.83992	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.70546	REGRESSION	3.	213230.16934	71076.72011	23.95895	.00
ADJUSTED R SQUARE	.67600	RESIDUAL	30.	89027.86908	2967.59564		
STD DEVIATION	54.47564	COEFF OF VARIABILITY	22.1 PCT				

--------- VARIABLES IN THE EQUATION ---------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	BETA ELASTICITY	F	SIGNIFICANCE		VARIABLE	PARTIAL	TOLERANCE	F

		SIGNIFICANCE	ELASTICITY
VOL	2.8099639	.4327744	42.157842	.6631612
MAND	2.7839267	.8723383	10.184827	.81708
TIME	-1.9457932	.9973118	.803	.3212963	.19209
(CONSTANT)	34.763646	39.64479	.840	-.2168819
		.388	-.15098

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	2.8099639	.4327744	6.4929078	1.9261287 : 3.6938071
MAND	2.7839267	.8723383	3.1913675	1.0823395 : 4.5654629
TIME	-1.9457932	.9973118	-2.145710	-3.7987699 : -.92816593E-01
CONSTANT	34.763646	39.64479	.87687804	-46.201817 : 115.72911

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MAND	TIME
VOL	.18729		
MAND	-.06586	.76096	
TIME	.07023	-.04825	.82321

IRETIREMENT PROJECTIONS, 8TH MONTH   10/14/82   20.33.46.   PAGE   7

FILE NONAME (CREATION DATE = 10/14/82)

* * * * * * * * * * * * MULTIPLE REGRESSION *

$DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	F TO ENTER OR REMOVE	SIGNIFICANCE	OVERALL F	SIGNIFICANCE
1	VOL		.75365	.56799	.56799	.75365	42.07286	.800	42.07286	.000
2	MAND		.81259	.66030	.09231	.42510	8.42435	.007	30.12879	.808
3	TIME		.83992	.70546	.04516	-.31971	4.59918	.040	23.95095	.000

IRETIREMENT PROJECTIONS, 8TH MONTH   10/14/82   20.33.46.   PAGE   8

FILE NONAME (CREATION DATE = 10/14/82)   * * * * MULTIPLE REGRESSION * * * *

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD		0.0		+2S
1.	228.0000	217.7808	10.21924		I	.		
2.	360.0000	300.2380	59.76196		I		.	
3.	458.0000	374.0621	83.93794		I		.	
4.	400.0000	325.1078	07.09004		I	.		
5.	202.0000	275.5951	6.40492		I	.		

6.	222.0000	287.5950	-65.59496
7.	162.0000	181.9148	-19.9140
8.	219.0000	298.8656	-79.8656
9.	224.0000	239.9466	-19.9466
10.	200.0000	198.6874	1.31264
11.	127.0000	202.3494	-15.3494
12.	201.0000	236.8150	-35.815
13.	299.0000	305.1965	-6.19655
14.	469.0000	426.7049	42.21568
15.	426.0000	374.9677	51.0322
16.	245.0000	318.8382	-65.8382
17.	191.0000	227.7419	-36.7419
18.	147.0000	183.6467	-36.6466
19.	180.0000	718.4127	-38.4127
20.	163.0000	217.5428	-40.5428
21.	171.0000	116.3986	4.6/1409
22.	171.0000	159.1079	11.0921
23.	152.0000	176.6756	-24.6756
24.	204.0000	191.7458	92.2541
25.	283.0000	310.4462	-27.4462
26.	313.0000	306.3983	-73.3983
27.	193.0000	264.2750	-71.2749
28.	361.0000	234.3858	126.6142
29.	345.0000	325.0386	19.9613
30.	207.0000	244.7523	-37.7232
31.	206.0000	175.1851	30.8148
32.	185.0000	149.2044	35.7956
33.	139.0000	88.14524	54.0140
34.	148.0000	156.0500	-0.05790

NOTE — (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   34.
NUMBER OF 2 S.D. OUTLIERS   1. OR   2.94 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.60608   DURBIN-WATSON TEST   1.55955

NUMBER OF POSITIVE RESIDUALS   16.
NUMBER OF NEGATIVE RESIDUALS   18.
NUMBER OF RUNS OF SIGNS   14.

EXPECTED NUMBER OF RUNS OF SIGNS   18.
EXPECTED S.D. OF RUN DISTRIBUTION   2.86072
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.   -1.29291
PROBABILITY OF OBTAINING .GE. ABS(Z)   .11451

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

```
RUN NAME          RETIREMENT PROJECTIONS, 9TH MONTH
VARIABLE LIST     ACCOMP,VOL,MAND,TIME
INPUT MEDIUM      DISK
N OF CASES        33
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,VOL,MAND,TIME
LIST CASES        CASES=33/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                  REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                  REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/
STATISTICS        ALL
```

00054400 CM NEEDED FOR REGRESSION

```
OPTION - 1 -
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

RETIREMENT PROJECTIONS, 9TH MONTH

FILE NONAME (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	360	75	16	1.
2	458	67	53	3.
3	400	67	23	4.
4	202	58	15	5.
5	222	63	21	6.
6	162	43	10	7.
7	219	83	7	8.
8	220	67	6	9.
9	200	53	5	10.
10	187	56	8	11.
11	201	58	11	12.
12	299	81	7	13.
13	400	129	11	14.
14	426	87	17	16.
15	245	70	34	17.
16	191	55	20	18.
17	147	44	19	19.
18	100	66	13	20.
19	165	55	17	21.
20	121	36	6	22.

```
21.  171.   42.   16.   23.
22.  152.   43.   20.   24.
23.  184.   49.   14.   25.
24.  283.   39.   21.   26.
25.  313.   87.   52.   27.
26.  193.   61.   27.   28.
27.  361.   61.   20.   29.
28.  345.   72.   25.   30.
29.  207.   72.   12.   31.
30.  206.   41.   19.   32.
31.  185.   55.    1.   34.
32.  139.   31.   11.   35.
33.  148.   41.   20.   33.
```

IRETIREMENT PROJECTIONS, 9TH MONTH   10/14/82   20.34.43.   PAGE   3

IRETIREMENT PROJECTIONS, 9TH MONTH   10/14/82   20.34.43.   PAGE   4

FILE   NONAME   (CREATION DATE = 10/14/82) * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	243.9091	97.4992	33
VOL	60.6667	19.3191	33
MAND	17.4848	11.4758	33
TIME	18.5758	10.1459	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND
VOL	.70319		
MAND	.41228	.14185	
TIME	-.36077	-.31530	.01551

IRETIREMENT PROJECTIONS, 9TH MONTH   10/14/82   20.34.43.   PAGE   5

FILE   NONAME   (CREATION DATE = 10/14/82) * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   243.90909   STD. DEV.   97.49916

VARIABLE(S) ENTERED ON STEP NUMBER   1..   VOL

-------- VARIABLES IN THE EQUATION --------

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
MULTIPLE R	.70319	REGRESSION	1.	150417.65769	150417.65769	30.32277	.00
R SQUARE	.49448						
ADJUSTED R SQUARE	.47817	RESIDUAL	31.	153777.06958	4960.55063		
STD DEVIATION	70.43118	COEFF OF VARIABILITY	28.9 PCT				

-------- VARIABLES NOT IN THE EQUATION --------

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VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.5489418	.6444592	30.322774 .000	.7031914 .88269		MAND	.44496	.97988	7.3687874 .011
(CONSTANT)	28.612691	48.975984	.48761573 .498			TIME	-.27659	.98859	1.3387378 .258

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

MULTIPLE R	.77982	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.59416	REGRESSION	2.	180741.10798	90370.55354	21.96861	.000
ADJUSTED R SQUARE	.56711	RESIDUAL	30.	123453.62028	4115.12067		
STD DEVIATION	64.14921	COEFF OF VARIABILITY	26.3 PCT				

------ VARIABLES IN THE EQUATION ------   ------ VARIABLES NOT IN THE EQUATION ------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.3295135	.5929829I	31.356398 .000	.6579489 .82594		TIME	-.26233	.89688	2.1432249 .154
MAND	2.7898372	.9982635B	7.3687874 .011	.3189533 .19426					
(CONSTANT)	-4.9164928	39.311257	.15641440E-01 .901						

3RETIREMENT PROJECTIONS, 9TH MONTH

FILE NONAME   (CREATION DATE = 10/14/82)   10/14/82   28.34.43.   PAGE   6
** . . . . . . * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * *
#DEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

MULTIPLE R	.78873	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.62209	REGRESSION	3.	189236.97961	63078.99328	15.91272	.000
ADJUSTED R SQUARE	.58398	RESIDUAL	29.	114957.74766	3964.06826		
STD DEVIATION	62.96878	COEFF OF VARIABILITY	25.8 PCT				

------ VARIABLES IN THE EQUATION ------   ------ VARIABLES NOT IN THE EQUATION ------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE

VOL	3.819477	.61447827	24.348787	.6897786
NAND	2.8819983	.98179818	8.1451379	.75413
				.3298589
TIME	-1.6957831	1.1583418	2.1432249	.2888
				-.1764657
(CONSTANT)	42.478871	58.366153	.71132548	.154
				.496

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.8 PCT CONFIDENCE INTERVAL
VOL	3.819477	.61447827	4.8342464	1.7752149 : 4.2886875
NAND	2.8819983	.98179818	2.8539688	.79481289 : 4.8899846
TIME	-1.6957831	1.1583418	-1.4639757	-4.8648565 : .67329838
CONSTANT	42.478871	58.366153	.8434#114	-68.531479 : 145.48922

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	NAND	TIME
VOL	.37757		
NAND	-.#9329	.96391	
TIME	.22832	-.#7292	1.34175

1RETIREMENT PROJECTIONS, 9TH MONTH 18/14/82 28.34.43. PAGE 7

FILE NONAME (CREATION DATE = 18/14/82) MULTIPLE REGRESSION ■■■■■■■■■■■■■■■■■■■■■■■■■■
8DEPENDENT VARIABLE.. ACCOMP VOL,NAND,TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		38.32277	.888	.78319	.49448	.49448	.78319	38.32277	.888
2	NAND		7.36879	.811	.77882	.59416	.89968	.41228	21.96861	.888
3	TIME		2.14322	.154	.78873	.62289	.82793	-.36877	15.91272	.888

1RETIREMENT PROJECTIONS, 9TH MONTH 18/14/82 28.34.43. PAGE 8

FILE NONAME (CREATION DATE = 18/14/82) MULTIPLE REGRESSION ■■■■■■■■■■■■■■■■■■■■■■■■■■

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	-SD	+2S
0				8.8		
1.	368.8888	313.8111	46.98886		I	
2.	458.8888	389.8378	68.96247		I	
3.	488.8188	288.1225	119.8775		I	
4.	282.8888	251.8829	38.11718		I	
5.	222.8888	282.1588	-68.15884		I	
6.	162.8888	189.8#21	-27.89212		I	

```
 7.    219.0000      307.1703      -91.17025
 8.    228.0000      247.1693      -27.16931
 9.    289.0000      289.2243       -.22459
10.    187.0000      216.8303      -29.83031
11.    201.0000      228.8044      -27.80442
12.    299.0000      285.6354       13.36456
13.    469.0000      440.6811       28.31886
14.    426.0000      326.7598       99.24024
15.    245.0000      321.1548      -76.15484
16.    191.0000      234.7519      -43.75186
17.    147.0000      196.9027      -49.90266
18.    180.0000      245.0977      -65.09773
19.    165.0000      221.2585      -56.25852
20.    121.0000      131.1337      -10.13375
21.    171.0000      175.6496       -4.64965
22.    152.0000      188.1930      -36.19379
23.    184.0000      187.8777       -3.87770
24.    283.0000      175.4764      107.5236
25.    313.0000      406.1761      -93.17609
26.    193.0000      255.5997      -62.59971
27.    361.0000      234.2899      126.7101
28.    345.0000      279.9556       65.04443
29.    247.0000      241.9338      -34.93381
30.    206.0000      165.7616       40.23037
31.    185.0000      154.3014       30.61863
32.    139.0000      107.9388       31.06118
33.    148.0000      166.0678      -18.06785
```

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   33.
NUMBER OF 2 S.D. OUTLIERS   1. OR   3.03 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.63769   DURBIN-WATSON TEST   1.58896

NUMBER OF POSITIVE RESIDUALS   13.
NUMBER OF NEGATIVE RESIDUALS   20.
NUMBER OF RUNS OF SIGNS   10.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.69574
UNIT NORMAL DEVIATE-
   Z-(EXPECTED-OBSERVED)/S.D.   -2.32129
PROBABILITY OF OBTAINING .GE. ABS(Z)   .01014
3RTHPRINT PROJECTION, 9TH MONTH

FILE   NONAME   (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME
                                                                                          10/14/82   20.34.43.   PAGE   9

MEAN RESPONSE   243.98989   STD. DEV.   97.49916

VARIABLE(S) ENTERED ON STEP NUMBER   1.. VOL

MULTIPLE R	.70319	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.49448	REGRESSION	1.	150417.65769	150417.65769	30.32277	.00
ADJUSTED R SQUARE	.47817	RESIDUAL	31.	153777.06958	4960.55063		
STD DEVIATION	70.43118	COEFF OF VARIABILITY	28.9 PCT				

```
------------------ VARIABLES IN THE EQUATION ------------------          ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE        B          STD ERROR B      F                 BETA           VARIABLE    PARTIAL    TOLERANCE       F
                                         SIGNIFICANCE       ELASTICITY                                                   SIGNIFICANCE

VOL          3.5488418      .6446928     38.322774          .7831914         MAND         .44486       .97988      21.96861
                                            .988             .88269                                                        .88
(CONSTANT)  28.612691      48.975894      .4876i573
                                          .498
```

```
VARIABLE(S) ENTERED ON STEP NUMBER  2..  MAND

MULTIPLE R         .77882        ANALYSIS OF VARIANCE    DF    SUM OF SQUARES     MEAN SQUARE
R SQUARE           .65416        REGRESSION              2.    18741.18788        9837B.55354
ADJUSTED R SQUARE  .56711        RESIDUAL               38.   123453.62828        4115.12867
STD DEVIATION     64.14921       COEFF OF VARIABILITY   26.3 PCT
```

```
------------------ VARIABLES IN THE EQUATION ------------------          ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE        B          STD ERROR B      F                 BETA           VARIABLE    PARTIAL    TOLERANCE       F
                                         SIGNIFICANCE       ELASTICITY                                                   SIGNIFICANCE

VOL          3.2285136      .59298291     31.356398          .6579489
                                           .888               .8258B
MAND         2.7898372      .99826358      7.3687874         .3185533
                                           .811               .13426
(CONSTANT)  -4.9164928     39.311257      .15641440E-81
                                          .981
```

ALL VARIABLES ARE IN THE EQUATION.
IRETIREMENT PROJECTIONS, 9TH MONTH

FILE NONAME (CREATION DATE = 18/14/82)   18/14/82   28.34.43.   PAGE 18
* * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * *
DEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

COEFFICIENTS AND CONFIDENCE INTERVALS.

```
VARIABLE       B          STD ERROR B         T          95.8 PCT CONFIDENCE INTERVAL

VOL         3.3285136      .59298291      5.5996784      2.1894889  :  4.5315462
MAND        2.7898372      .99826358      2.7145511      .67111117  :  4.7485633
CONSTANT   -4.9164928    39.311267      -.12586577     -85.2897751  : 75.367885
```

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL   .35163   .99653
MAND   -.00397

         VOL   MAND

1RETIREMENT PROJECTIONS. 9TH MONTH   10/14/82   20.34.43.   PAGE 11

FILE NONAME (CREATION DATE = 10/14/82)
* * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

                                      S U M M A R Y   T A B L E

STEP VARIABLE   VARIABLE   F TO
      ENTERED   REMOVED   ENTER OR REMOVE SIGNIFICANCE MULTIPLE R R SQUARE R SQUARE   SIMPLE R   OVERALL F   SIGNIFICANCE
                                                                                CHANGE

 1   VOL   30.32277   .000   .70319   .49448   .49448   .70319   30.32277   .000
 2   MAND   7.36879   .011   .77002   .59416   .09968   .41228   21.96061   .000
1RETIREMENT PROJECTIONS. 9TH MONTH   10/14/82   20.34.43.   PAGE 12

FILE NONAME (CREATION DATE = 10/14/82)
* * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * *

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2S
1.	360.0000	287.4794	72.52058			
2.	458.0000	361.1793	96.82071			
3.	408.0000	263.2816	144.71784			
4.	272.0000	220.3209	53.67915			
5.	162.0000	261.1024	-39.10244			
6.	162.0000	164.9648	-2.96396			
7.	219.0000	289.6550	-70.65499			
8.	220.0000	233.8169	-13.81694			
9.	200.0000	184.6199	15.38009			
10.	107.0000	282.7110	-15.71097			
11.	201.0000	217.4815	-16.44150			
12.	299.0003	283.0140	15.93603			
13.	469.0000	453.2360	15.76203			
14.	426.0000	330.0354	95.96450			
15.	244.0000	319.6539	-74.65192			
16.	191.0000	231.9905	-40.90050			
17.	147.0000	192.6730	-45.67301			
18.	180.0000	249.4653	-69.46534			
19.	165.0000	223.7700	-58.77000			
20.	120.0000	130.0010	-9.00100			
21.	171.0000	177.9025	-6.90247			
22.	152.0000	192.0623	-40.06234			
23.	184.0000	195.7264	-11.72639			
24.	283.0000	181.4901	101.50999			
25.	313.0000	424.0797	-111.0797			
26.	193.0000	270.0044	-77.00044			
27.	361.0000	251.8316	109.1604			
28.	345.0000	301.9064	43.09350			
29.	207.0000	266.6785	-59.67053			
30.	206.0000	182.7115	23.20053			
31.	189.0000	184.4216	4.57840			
32.	139.0000	127.8276	11.17236			
33.	148.0000	185.4213	-37.42131			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   33. OR   3.83 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   1.

VON NEUMANN RATIO   1.68822   DURBIN-WATSON TEST   1.55949

NUMBER OF POSITIVE RESIDUALS   14.
NUMBER OF NEGATIVE RESIDUALS   19.
NUMBER OF RUNS OF SIGNS   12.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.76045
UNIT NORMAL DEVIATE-
   /-(EXPECTED-OBSERVED)/S.D.   -1.67432
PROBABILITY OF OBTAINING .GE. ABS(Z)   .04783
(RETIREMENT PROJECTIONS, 9TH MONTH

CPU TIME REQUIRED..   .2364 SECONDS

              FINISH

TOTAL CPU TIME USED..   .2778 SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ 12
NUMBER OF ERRORS DETECTED   8
$

10/14/82   28.34.43.   PAGE 13

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S P S S -- STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

```
RUN NAME          RETIREMENT PROJECTIONS, 10TH MONTH
VARIABLE LIST     ACCOMP,VOL,MAND,TIME
INPUT MEDIUM      DISK
N OF CASES        32
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,VOL,MAND,TIME
LIST CASES        CASES=32/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                  REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                  REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS        ALL
```

30054400 CM NEEDED FOR REGRESSION

```
OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

RETIREMENT PROJECTIONS, 10TH MONTH

FILE NONAME (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	458.	59.	56.	2.
2	408.	57.	23.	3.
3	282.	51.	16.	4.
4	222.	55.	21.	5.
5	162.	39.	12.	6.
6	219.	77.	8.	7.
7	228.	58.	6.	8.
8	208.	58.	6.	9.
9	187.	49.	8.	10.
10	201.	56.	12.	11.
11	299.	75.	7.	12.
12	469.	111.	11.	13.
13	426.	68.	10.	15.
14	245.	51.	39.	16.
15	191.	47.	22.	17.
16	147.	40.	20.	18.
17	188.	56.	15.	19.
18	165.	47.	17.	20.
19	171.	31.	6.	21.
20	171.	40.	19.	22.

```
21.    162.    42.    21.
22.    184.    46.    14.
23.    203.    75.    22.
24.    313.    73.    55.
25.    193.    56.    27.
26.    361.    47.    21.
27.    345.    60.    25.
28.    287.    60.    13.
29.    296.    33.    30.
30.    185.    47.    28.
31.    139.    26.    11.
32.    148.    33.    21.
```

IRETIREMENT PROJECTIONS, 18TH MONTH   18/14/82   28.36.34.   PAGE   3

IRETIREMENT PROJECTIONS, 18TH MONTH   18/14/82   28.36.34.   PAGE   4

FILE NONAME   (CREATION DATE = 18/14/82)
* * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	248.2813	96.7698	32
VOL	53.6258	16.6341	32
MAND	18.6875	12.1728	32
TIME	18.2188	9.9474	32

CORRELATION COEFFICIENTS.

A VALUE OF 99.88888 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	.68269	.89388	
VOL	.45868	-.31668	.82118
MAND	ACCOMP	VOL	MAND
TIME			

IRETIREMENT PROJECTIONS, 18TH MONTH   18/14/82   28.36.34.   PAGE   5

FILE NONAME   (CREATION DATE = 18/14/82)
* * * * * * * * * * * * *   M U L T I P L E   R E G R E S S I O N   * * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   248.28125   STD. DEV.   96.76984

VARIABLE(S) ENTERED ON STEP NUMBER   1.. VOL

MULTIPLE R	.68269	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.46587	REGRESSION	1.	135297.91963	135297.91963	26.18894	.88
ADJUSTED R SQUARE	.44827	RESIDUAL	38.	154998.54912	5166.61838		
STD DEVIATION	71.87919	COEFF OF VARIABILITY	29.9 PCT				

-------------- VARIABLES IN THE EQUATION --------------   --------- VARIABLES NOT IN THE EQUATION ---------
```

| VARIABLE | B | STD ERROR B | F SIGNIFICANCE | BETA ELASTICITY |
|---|---|---|---|---|
| VOL | 3.9719972 | .77619919 | 26.186939 .000 | .6826918 |
| (CONSTANT) | 27.304350 | 43.515353 | .39371201 .535 | .00637 |

• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

| | | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|---|---|---|---|---|---|---|---|
| MULTIPLE R | .76542 | REGRESSION | 2. | 170075.33435 | 85037.66718 | 20.51297 | .00 |
| R SQUARE | .58507 | RESIDUAL | 29. | 120221.13449 | 4145.55636 | | |
| ADJUSTED R SQUARE | .55731 | COEFF OF VARIABILITY | 26.8 PCT | | | | |
| STD DEVIATION | 64.38690 | | | | | | |

--------- VARIABLES IN THE EQUATION ---------

| VARIABLE | B | STD ERROR B | F SIGNIFICANCE | BETA ELASTICITY |
|---|---|---|---|---|
| VOL | 3.7817223 | .69828608 | 29.339039 .000 | .6500535 |
| MAND | 2.7639484 | .95427036 | 8.3890826 .007 | .04399 .476563 |
| (CONSTANT) | -14.164745 | 41.525337 | .11635664 .735 | .21496 |

--------- VARIABLES NOT IN THE EQUATION ---------

| VARIABLE | PARTIAL | TOLERANCE | F | SIGNIFICANCE |
|---|---|---|---|---|
| MAND | .47368 | .99119 | 8.3890826 | |
| TIME | -.15190 | .89972 | .6848976 .000 | .067 .415 |

--------- VARIABLES NOT IN THE EQUATION ---------

| VARIABLE | PARTIAL | TOLERANCE | F | SIGNIFICANCE |
|---|---|---|---|---|
| TIME | -.20171 | .89711 | 1.1875836 | .285 |

RETIREMENT PROJECTIONS, 18TH MONTH                    10/14/82   20.36.34.   PAGE  6

FILE   NONAME   (CREATION DATE = 18/14/82 )
• • • • • • • • • • • M U L T I P L E   R E G R E S S I O N • • • • • • • • • • •
DEPENDENT VARIABLE.. ACCOMP       VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

| | | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|---|---|---|---|---|---|---|---|
| MULTIPLE R | .77635 | REGRESSION | 3. | 174966.88798 | 58322.29599 | 14.15963 | .00 |
| R SQUARE | .60272 | RESIDUAL | 28. | 116329.58077 | 4118.91368 | | |
| ADJUSTED R SQUARE | .56015 | COEFF OF VARIABILITY | 26.7 PCT | | | | |
| STD DEVIATION | 64.17876 | | | | | | |

--------- VARIABLES IN THE EQUATION ---------

| VARIABLE | B | STD ERROR B | F SIGNIFICANCE | BETA ELASTICITY |
|---|---|---|---|---|

--------- VARIABLES NOT IN THE EQUATION ---------

| VARIABLE | PARTIAL | TOLERANCE | F | SIGNIFICANCE |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| VOL | 3.5253987 | .73470650 | 23.52421 | .6559932 |
| MAND | 2.8190128 | .9626797 | 8.7625994 | .78678 |
| TIME | -1.3332469 | 1.2234283 | 1.1875035 | .21931 |
| (CONSTANT) | 22.026584 | 53.530294 | .18103714 | .673 |

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

| VARIABLE | B | STD ERROR B | T | 95.0 PCT CONFIDENCE INTERVAL | |
|---|---|---|---|---|---|
| VOL | 3.5253907 | .73470650 | 4.7903769 | 2.5204257 | 5.5503760 |
| MAND | 2.8190128 | .9525797 | 2.9601857 | .8654174 | 4.7710839 |
| TIME | -1.3332469 | 1.2234283 | -1.0893763 | -3.0393261 | 1.1720323 |
| CONSTANT | 22.826584 | 53.530294 | .42642366 | -86.025253 | 132.47842 |

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

| | | | |
|---|---|---|---|
| VOL | .53979 | | |
| MAND | -.87422 | .90741 | |
| TIME | .20776 | -.06273 | 1.49678 |
| | VOL | MAND | TIME |

RETIREMENT PROJECTIONS, 18TH MONTH

10/14/82   20.36.34.   PAGE  7

FILE  NONAME  (CREATION DATE = 10/14/82 )
DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

* * * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * * *

S U M M A R Y   T A B L E

| STEP | VARIABLE ENTERED REMOVED | F TO ENTER OR REMOVE | SIGNIFICANCE | MULTIPLE R | R SQUARE | R SQUARE CHANGE | SIMPLE R | OVERALL F | SIGNIFICANCE |
|---|---|---|---|---|---|---|---|---|---|
| 1 | VOL | 26.18694 | .000 | .66269 | .46607 | .46607 | .66269 | 26.18694 | .000 |
| 2 | MAND | 8.38908 | .007 | .76542 | .58587 | .11980 | .48868 | 20.51297 | .000 |
| 3 | TIME | 1.10758 | .285 | .77635 | .60272 | .01685 | -.32147 | 14.15963 | .000 |

RETIREMENT PROJECTIONS, 18TH MONTH

10/14/82   20.36.34.   PAGE  8

FILE  NONAME  (CREATION DATE = 10/14/82 )

* * * * * * * * * * * MULTIPLE REGRESSION * * * * * * * * * * *

| OBSERVATION | Y VALUE | Y ESTIMATE | RESIDUAL |
|---|---|---|---|
| 1. | 458.0000 | 386.0601 | 71.93187 |
| 2. | 408.0000 | 284.6303 | 123.3697 |
| 3. | 282.0000 | 242.4059 | 39.59406 |
| 4. | 222.0000 | 269.2733 | -47.27335 |
| 5. | 162.0000 | 186.1554 | -24.15541 |
| 6. | 219.0000 | 307.5601 | -88.50006 |
| 7. | 220.0000 | 233.5526 | -13.55261 |

-2SD   -SD   0.0   +2S

| | | |
|---|---|---|
| 8. | 200.0000 | 204.8162 | -4.016174 |
| 9. | 187.0000 | 204.7972 | -17.79715 |
| 10. | 201.0000 | 239.4295 | -30.42095 |
| 11. | 299.0000 | 290.9712 | 8.028786 |
| 12. | 469.0000 | 427.8316 | 41.16843 |
| 13. | 426.0000 | 293.3116 | 132.6904 |
| 14. | 245.0000 | 291.2627 | -46.26267 |
| 15. | 191.0000 | 227.8910 | -36.89101 |
| 16. | 147.0000 | 196.2403 | -49.24034 |
| 17. | 180.0000 | 237.2144 | -57.2144 |
| 18. | 165.0000 | 209.7922 | -44.79220 |
| 19. | 121.0000 | 124.5600 | -3.560035 |
| 20. | 171.0000 | 188.0075 | -17.00754 |
| 21. | 152.0000 | 199.4447 | -47.44472 |
| 22. | 184.0000 | 192.4744 | -0.474379 |
| 23. | 203.0000 | 315.9362 | -32.93628 |
| 24. | 313.0000 | 400.6900 | -87.68598 |
| 25. | 193.0000 | 260.3862 | -67.38619 |
| 26. | 361.0000 | 210.4055 | 150.5945 |
| 27. | 345.0000 | 266.1017 | 78.81833 |
| 28. | 207.0000 | 231.8107 | -24.81067 |
| 29. | 206.0000 | 154.2303 | 51.76966 |
| 30. | 185.0000 | 161.4421 | 23.55795 |
| 31. | 139.0000 | 100.1745 | 30.82558 |
| 32. | 148.0000 | 151.7172 | -3.717170 |

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED          32.
NUMBER OF 2 S.D. OUTLIERS         2. OR   6.25 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.36465        DURBIN-WATSON TEST   1.32285

NUMBER OF POSITIVE RESIDUALS     11.
NUMBER OF NEGATIVE RESIDUALS     21.
NUMBER OF RUNS OF SIGNS           8.

EXPECTED NUMBER OF RUNS OF SIGNS                    15.
EXPECTED S.D. OF RUN DISTRIBUTION              2.58164
UNIT NORMAL DEVIATE-
Z-(EXPECTED-OBSERVED)/S.D.                    -2.77318
PROBABILITY OF OBTAINING .GE. ABS(Z)           .05278
(RETIREMENT PROJECTIONS. 10TH MONTH

FILE   NONAME   (CREATION DATE = 10/14/82 )
* * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..   ACCOMP       VOL,MAND,TIME

MEAN RESPONSE   245.28125     STD. DEV.   96.76984

VARIABLE(S) ENTERED ON STEP NUMBER   1..   VOL

| | | | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|---|---|---|---|---|---|---|---|---|
| MULTIPLE R | .68269 | | | | | | 26.18694 | .00 |
| R SQUARE | .46607 | | REGRESSION | 1. | 135297.91963 | 135297.91963 | | |
| ADJUSTED R SQUARE | .44827 | | RESIDUAL | 30. | 154998.54912 | 5166.61830 | | |
| STD DEVIATION | 71.87919 | | COEFF OF VARIABILITY   29.9 PCT | | | | | |

10/14/82   20.36.34.   PAGE   9

| VARIABLE | B | STD ERROR B | F SIGNIFICANCE | BETA ELASTICITY | | VARIABLE | PARTIAL | TOLERANCE | F SIGNIFICANCE |
|----------|---|-------------|----------------|-----------------|--|----------|---------|-----------|----------------|
| VOL | 3.9715972 | .7761Ø919 | 26.186939 | .6826918 | | MAND | .47368 | .99119 | 8.389Ø826 |
| (CONSTANT) | 27.3Ø435Ø | 43.615353 | .ØØØ .39371Ø1 .635 | .ØØ637 | | | | | .ØØ7 |

VARIABLE(S) ENTERED ON STEP NUMBER   2..   MAND

| MULTIPLE R | .76542 | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|------------|--------|----------------------|----|----------------|-------------|---|-------------|
| R SQUARE | .58587 | REGRESSION | 2. | 17ØØ75.33435 | 85Ø37.66718 | 2Ø.61297 | .ØØ |
| ADJUSTED R SQUARE | .55731 | RESIDUAL | 29. | 12Ø221.1344Ø | 4145.55636 | | |
| STD DEVIATION | 64.386ØØ | COEFF OF VARIABILITY. | 26.8 PCT | | | | |

----------- VARIABLES IN THE EQUATION -----------          --------- VARIABLES NOT IN THE EQUATION ---------

| VARIABLE | B | STD ERROR B | F SIGNIFICANCE | BETA ELASTICITY | | VARIABLE | PARTIAL | TOLERANCE | F SIGNIFICANCE |
|----------|---|-------------|----------------|-----------------|--|----------|---------|-----------|----------------|
| VOL | 3.7Ø17223 | .69Ø286ØØ | 29.33ØØ3Ø | .65ØØ535 | | | | | |
| MAND | 2.7639484 | .95427Ø36 | .ØØØ 8.389Ø826 | .84399 .3476563 | | | | | |
| (CONSTANT) | -14.164745 | 41.525337 | .ØØ7 .11635664 .735 | .21496 | | | | | |

ALL VARIABLES ARE IN THE EQUATION.
IRETIREMENT PROJECTIONS. 1ØTH MONTH

COEFFICIENTS AND CONFIDENCE INTERVALS.

| VARIABLE | B | STD ERROR B | T | 95.Ø PCT CONFIDENCE INTERVAL |
|----------|---|-------------|---|------------------------------|
| VOL | 3.7Ø17223 | .69Ø286ØØ | 5.41572Ø6 | 2.3535669 : 5.2Ø98777 |
| MAND | 2.7639484 | .95427Ø36 | 2.8963913 | .1223833 : 4.7156424 |
| CONSTANT | -14.164745 | 41.525337 | -.34111Ø89 | -Ø9.Ø93596 : 7Ø.764187 |

VARIANCE/ ARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL       .4076    .91963
MAND     -.06256

VOL    MAND

IRETIREMENT PROJECTIONS, 18TH MONTH                          18/14/82    28.36.34.    PAGE  11

FILE  NONAME  (CREATION DATE = 18/14/82)
* * * * * * * * * * * * * * *  M U L T I P L E   R E G R E S S I O N  * * * * * * * * * * * * * * *
DEPENDENT VARIABLE..    ACCOMP    VOL,MAND,TIME

S U M M A R Y   T A B L E

| STEP | VARIABLE ENTERED | VARIABLE REMOVED | F TO ENTER OR REMOVE | SIGNIFICANCE | MULTIPLE R | R SQUARE | R SQUARE CHANGE | SIMPLE R | OVERALL F | SIGNIFICANCE |
|------|------|------|------|------|------|------|------|------|------|------|
| 1 | VOL | | 26.18694 | .000 | .68269 | .46607 | .46607 | .68269 | 26.18694 | .000 |
| 2 | MAND | | 8.38968 | .007 | .76542 | .58587 | .11980 | .4068 | 20.51297 | .000 |

IRETIREMENT PROJECTIONS, 18TH MONTH                          18/14/82    28.36.34.    PAGE  12

FILE  NONAME  (CREATION DATE = 18/14/82)
* * * * * * * * * * * * * * *  M U L T I P L E   R E G R E S S I O N  * * * * * * * * * * * * * * *

| OBSERVATION | Y VALUE | Y ESTIMATE | RESIDUAL | -2SD | 0.0 | +2S |
|------|------|------|------|------|------|------|
| 1. | 458.0000 | 363.7375 | 94.26247 | | | R |
| 2. | 400.0000 | 264.9641 | 143.0359 | | | |
| 3. | 282.0100 | 222.9761 | 59.07306 | | | |
| 4. | 222.0000 | 251.0727 | -29.07273 | | | |
| 5. | 162.0000 | 166.4897 | -4.48971 | | | |
| 6. | 219.0000 | 299.1394 | -80.13940 | | | |
| 7. | 220.0000 | 221.7508 | -1.750792 | | | |
| 8. | 200.0000 | 191.5058 | 8.494087 | | | |
| 9. | 187.0000 | 193.2512 | -6.251172 | | | |
| 10. | 241.0000 | 238.7798 | -29.77899 | | | |
| 11. | 239.0000 | 208.0128 | 10.10799 | | | |
| 12. | 469.0000 | 436.0098 | 32.99022 | | | |
| 13. | 426.0000 | 292.7433 | 133.2567 | | | |
| 14. | 245.0000 | 246.4968 | -41.49677 | | | |
| 15. | 191.0000 | 224.3029 | -33.30709 | | | |
| 16. | 147.0000 | 192.3828 | -45.38296 | | | |
| 17. | 180.0000 | 239.8708 | -59.87081 | | | |
| 18. | 165.0000 | 210.5632 | -45.56319 | | | |
| 19. | 121.0000 | 123.4348 | -2.434012 | | | |
| 20. | 171.0000 | 189.6198 | -18.61981 | | | |
| 21. | 152.0000 | 202.7103 | -50.71034 | | | |
| 22. | 184.0000 | 198.4896 | -14.48965 | | | |
| 23. | 283.0000 | 330.2711 | -47.27112 | | | |
| 24. | 313.0000 | 413.9177 | -100.9177 | | | |
| 25. | 193.0000 | 272.2301 | -79.23089 | | | |
| 26. | 361.0000 | 221.6198 | 139.3810 | | | |
| 27. | 345.0000 | 281.8371 | 63.16290 | | | |
| 28. | 207.0000 | 248.6698 | -41.66982 | | | |
| 29. | 286.0000 | 165.9109 | 40.08910 | | | |
| 30. | 185.0000 | 180.1508 | 4.848154 | | | |
| 31. | 139.0000 | 114.5634 | 24.43662 | | | |
| 32. | 140.0000 | 168.6748 | -28.67404 | | | |

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

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NUMBER OF CASES PLOTTED          32.
NUMBER OF 2 S.D. OUTLIERS         3. OR  9.38 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.35528          DURBIN-WATSON TEST   1.31293

NUMBER OF POSITIVE RESIDUALS     12.
NUMBER OF NEGATIVE RESIDUALS     28.
NUMBER OF RUNS OF SIGNS          18.

EXPECTED NUMBER OF RUNS OF SIGNS         16.
EXPECTED S.D. OF RUN DISTRIBUTION      2.68273
UNIT NORMAL DEVIATE-
 $Z=(EXPECTED-OBSERVED)/S.D.$          -2.11317
PROBABILITY OF OBTAINING .GE. ABS(Z)    .01729
IRETIREMENT PROJECTIONS, 18TH MONTH          18/14/82     28.36.34.     PAGE  '13

CPU TIME REQUIRED..      .2368 SECONDS

                    FINISH

TOTAL CPU TIME USED..    .2768 SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ   12
NUMBER OF ERRORS DETECTED       8
S

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME            RETIREMENT PROJECTIONS, 11TH MONTH
VARIABLE LIST       ACCOMP,VOL,MAND,TIME
INPUT MEDIUM        DISK
N OF CASES          32
INPUT FORMAT        FREEFIELD
VAR LABELS          ACCOMP,VOL,MAND,TIME
LIST CASES          CASES=32/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION          METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                    REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                    REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
STATISTICS          ALL

00054400 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 11TH MONTH
FILE  NONAME    (CREATION DATE = 10/14/82 )

| CASE-NO | ACCOMP | VOL | MAND | TIME |
|---|---|---|---|---|
| 1 | 458. | 52. | 57. | 1. |
| 2 | 400. | 46. | 23. | 2. |
| 3 | 242. | 48. | 16. | 3. |
| 4 | 222. | 41. | 22. | 4. |
| 5 | 162. | 33. | 12. | 5. |
| 6 | 219. | 62. | 9. | 6. |
| 7 | 228. | 46. | 6. | 7. |
| 8 | 200. | 43. | 7. | 8. |
| 9 | 187. | 42. | 8. | 9. |
| 10 | 201. | 53. | 12. | 10. |
| 11 | 299. | 59. | 7. | 11. |
| 12 | 469. | 85. | 11. | 12. |
| 13 | 426. | 58. | 19. | 14. |
| 14 | 245. | 41. | 39. | 15. |
| 15 | 191. | 35. | 23. | 16. |
| 16 | 147. | 37. | 22. | 17. |
| 17 | 188. | 50. | 16. | 18. |
| 18 | 165. | 41. | 21. | 19. |
| 19 | 121. | 29. | 8. | 20. |
| 20 | 171. | 36. | 28. | 21. |

1RETIREMENT PROJECTIONS, 11TH MONTH     10/14/82   20.41.16.   PAGE 3

1RETIREMENT PROJECTIONS, 11TH MONTH     10/14/82   20.41.16.   PAGE 4

FILE  NONAME  (CREATION DATE = 10/14/82.)  * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * *

| VARIABLE | MEAN | STANDARD DEV | CASES |
|---|---|---|---|
| ACCOMP | 240.2813 | 96.7698 | 32 |
| VOL | 44.5313 | 12.4384 | 32 |
| MAND | 19.1875 | 12.1534 | 32 |
| TIME | 17.2188 | 9.9474 | 32 |

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

|  | ACCOMP | VOL | MAND |
|---|---|---|---|
| VOL | .67910 |  |  |
| MAND | .39594 | .06850 |  |
| TIME | -.32147 | -.36387 | .00712 |

1RETIREMENT PROJECTIONS, 11TH MONTH     10/14/82   20.41.16.   PAGE 6

FILE  NONAME  (CREATION DATE = 10/14/82.)  * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * *
DEPENDENT VARIABLE..  ACCOMP    VOL,MAND,TIME

MEAN RESPONSE  240.28125    STD. DEV.  96.76984

VARIABLE(S) ENTERED ON STEP NUMBER  1..  VOL

| MULTIPLE R | .67910 | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|---|---|---|---|---|---|---|---|
| R SQUARE | .46117 | REGRESSION | 1. | 133076.74144 | 133076.74144 | 25.67644 | .00 |
| ADJUSTED R SQUARE | .44321 | RESIDUAL | 30. | 156419.72731 | 5213.99091 |  |  |
| STD DEVIATION | 72.20797 | COEFF OF VARIABILITY | 30.1 PCT |  |  |  |  |

--------- VARIABLES IN THE EQUATION ---------     --------- VARIABLES NOT IN THE EQUATION ---------

VARIABLE          B          STD ERROR B      BETA
                                              ELASTICITY

VOL            8.286719#     1.#43323#        .679#968      25.676443
                                              .97973
(CONSTANT)     4.#57#45#     4#.1#2#85        .1#161#57E-#1
                                              .92#

VARIABLE       PARTIAL    TOLERANCE       F
                                          SIGNIFICANCE

MAND            .47713      .99531         #.548#922
                                           .##7
TIME           -.1#952      .6681#         .3524#467
                                           .558

· · · · · · · · · · · · · · · · · · · · · · · · · · · ·

VARIABLE(S) ENTERED ON STEP NUMBER   2.. MAND

MULTIPLE R          .764#9       ANALYSIS OF VARIANCE     DF      SUM OF SQUARES      MEAN SQUARE         F            SIGNIFICANCE
R SQUARE            .5#3#4       REGRESSION               2.      16948#.81291        8#743.4#646         2#.3424#        .##
ADJUSTED R SQUARE   .5551#       RESIDUAL                 29.     12#8#9.65584        4165.85#2#
STD DEVIATION       64.5434#     COEFF OF VARIABILITY     26.9 PCT

-------- VARIABLES IN THE EQUATION --------                    -------- VARIABLES NOT IN THE EQUATION --------

VARIABLE       B          STD ERROR B        BETA                      VARIABLE     PARTIAL    TOLERANCE       F
                                             ELASTICITY                                                       SIGNIFICANCE
                                             F SIGNIFICANCE
VOL          5.#995#12     .93477451         .655#481        29.76#6##    TIME       -.14339     .86715         .68781352
                                             .945#9           .###                                             .45#
MAND         2.7952999     .9568798#6        .351#645        #.548#922
                                             .22322           .##7
(CONSTANT)  -4#.4#8731     45.769776                          78#69325
                                             .384

IRETIREMENT PROJECTIONS, 11TH MONTH                              1#/14/#2   2#.41.16.   PAGE   6

FILE  NONAME   (CREATION DATE - 1#/14/#2 )
#DEPENDENT VARIABLE..  ACCOMP     VOL,MAND,TIME    M U L T I P L E   R E G R E S S I O N · · · · · · · · · · · · · · · · · · · · · ·

VARIABLE(S) ENTERED ON STEP NUMBER   3.. TIME

MULTIPLE R          .76967       ANALYSIS OF VARIANCE     DF      SUM OF SQUARES      MEAN SQUARE         F            SIGNIFICANC
R SQUARE            .5924#       REGRESSION               3.      1719#7#.#6257       57323.62#86         13.56478        .##
ADJUSTED R SQUARE   .54873       RESIDUAL                 28.     11#326.6#61#        4225.91451
STD DEVIATION       65.##7#3     COEFF OF VARIABILITY     27.1 PCT

-------- VARIABLES IN THE EQUATION --------                    -------- VARIABLES NOT IN THE EQUATION --------

VARIABLE       B          STD ERROR B        BETA                      VARIABLE     PARTIAL    TOLERANCE       F
                                             ELASTICITY                                                       SIGNIFICANCE
                                             F SIGNIFICANCE

| | | | |
|---|---|---|---|
| VOL | 4.817211 | 1.011148 | 22.78847 | .617625 |
| MAND | 2.827238 | .9635177 | 8.674129 | .89274 |
| TIME | -.9663694 | 1.260436 | .857 | .3542676 |
| | | | .45 | .22525 |
| (CONSTANT) | -11.789607 | 59.48865 | .3805010E-01 | -.993373 |
| | | | .845 | -.06925 |

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

| VARIABLE | B | STD ERROR B | T | 95.0 PCT CONFIDENCE INTERVAL |
|---|---|---|---|---|
| VOL | 4.817211 | 1.011148 | 4.7645406 | 2.7460512 : 6.8079911 |
| MAND | 2.827238 | .9635177 | 2.9275268 | .8478473 : 4.7944894 |
| TIME | -.9663694 | 1.260436 | -.76668907 | -3.5482712 : 1.6155322 |
| CONSTANT | -11.789607 | 59.48865 | -.19710488 | -133.48279 : 109.98342 |

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

| | VOL | MAND | TIME |
|---|---|---|---|
| VOL | 1.02215 | | |
| MAND | -.07432 | .92837 | |
| TIME | .6440 | -.0418 | 1.58872 |

IRETIREMENT PROJECTIONS, 11TH MONTH

FILE   NONAME   (CREATION DATE = 10/14/82 )
* * * * * * * * * * * * * *  M U L T I P L E   R E G R E S S I O N  * * * * * * * * * * * * * *    10/14/82    28.41.16.    PAGE   7
DEPENDENT VARIABLE..   ACCOMP      VOL,MAND,TIME

S U M M A R Y   T A B L E

| STEP | VARIABLE ENTERED | VARIABLE REMOVED | F TO ENTER OR REMOVE | SIGNIFICANCE | MULTIPLE R | R SQUARE | R SQUARE CHANGE | SIMPLE R | OVERALL F | SIGNIFICANCE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | VOL | | 25.67644 | .000 | .67918 | .46117 | .46117 | .67918 | 25.67644 | .000 |
| 2 | MAND | | 8.54809 | .007 | .76489 | .58384 | .12267 | .39594 | 20.34248 | .000 |
| 3 | TIME | | .58781 | .450 | .76967 | .59248 | .00856 | -.32147 | 13.56478 | .000 |

IRETIREMENT PROJECTIONS, 11TH MONTH                                    10/14/82    28.41.16.    PAGE   8

FILE   NONAME   (CREATION DATE = 10/14/82 )
* * * * * * * * * * * * *  M U L T I P L E   R E G R E S S I O N  * * * * * * * * * * * * * *

| OBSERVATION | Y VALUE | Y ESTIMATE | RESIDUAL | -2SD | 0.0 | +2S |
|---|---|---|---|---|---|---|
| D | | | | | | |
| 1. | 458.0000 | 398.5903 | 59.40970 | | I | R |
| 2. | 408.0000 | 272.8172 | 135.1820 | | I | |
| 3. | 282.0000 | 261.7398 | 20.26020 | | I | |
| 4. | 272.0000 | 243.9786 | -21.97063 | | I | |
| 5. | 162.0000 | 176.2608 | -14.26085 | | I | |
| 6. | 219.0000 | 306.5339 | -87.53392 | | I | |
| 7. | 220.0000 | 228.0330 | -.3304221E-01 | | | |

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| | | |
|---|---|---|
| 8. | 298.0000 207.4363 | -7.436333 |
| 9. | 187.0000 204.4737 | -17.47367 |
| 10. | 201.0000 267.7774 | -66.77742 |
| 11. | 299.9000 281.6096 | 17.39044 |
| 12. | 469.0000 417.1606 | 51.83136 |
| 13. | 446.0000 307.7421 | 118.2579 |
| 14. | 245.0000 281.3009 | -36.30087 |
| 15. | 191.0000 206.3000 | -15.30079 |
| 16. | 147.0000 212.1477 | -65.14774 |
| 17. | 180.0000 256.8703 | -76.87030 |
| 18. | 165.0000 226.6624 | -61.66236 |
| 19. | 121.0000 131.2223 | -10.22233 |
| 20. | 171.0000 197.6238 | -26.62379 |
| 21. | 152.0000 185.2271 | -33.22748 |
| 22. | 184.0000 205.0774 | -21.07754 |
| 23. | 311.0000 347.9917 | -37.99166 |
| 24. | 152.0000 191.0411 | -39.04110 |
| 25. | 193.0000 232.0051 | 156.519 |
| 26. | 361.0000 204.4803 | -82.03292 |
| 27. | 345.0000 262.9671 | -45.47011 |
| 28. | 207.0000 247.4701 | 52.58098 |
| 29. | 206.0000 153.4118 | 46.93045 |
| 30. | 139.0000 138.0696 | 26.32937 |
| 31. | 139.0000 112.6786 | -5.538138 |
| 32. | 148.0000 153.5381 | |

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED        32.  OR  6.25 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS       2.

VON NEUMANN RATIO   1.32692      DURBIN-WATSON TEST  1.28546

NUMBER OF POSITIVE RESIDUALS   11.
NUMBER OF NEGATIVE RESIDUALS   21.
NUMBER OF RUNS OF SIGNS         8.

EXPECTED NUMBER OF RUNS OF SIGNS             15.
EXPECTED S.D. OF RUN DISTRIBUTION            2.56164
UNIT NORMAL DEVIATE-
  Z=(EXPECTED-OBSERVED)/S.D.                -2.77318
PROBABILITY OF OBTAINING .GE. ABS(Z)        .00278
1RETIREMENT PROJECTIONS, 11TH MONTH

FILE  NONAME  (CREATION DATE = 10/14/82 )                    10/14/82   20.41.16.   PAGE  9
* * * * * * * * * * * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * * * * * * * *
0DEPENDENT VARIABLE..   ACCOMP       VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER  1..  VOL

MEAN RESPONSE   240.28125      STD. DEV.   96.76984

| | | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|---|---|---|---|---|---|---|---|
| MULTIPLE R | .67918 | REGRESSION | 1. | 133876.74144 | 133876.74144 | 25.67644 | .00 |
| R SQUARE | .46117 | | | | | | |
| ADJUSTED R SQUARE | .44321 | RESIDUAL | 30. | 156419.72731 | 5213.99091 | | |
| STD DEVIATION | 72.20797 | COEFF OF VARIABILITY | 30.1 PCT | | | | |

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------- VARIABLES IN THE EQUATION -------

| VARIABLE | B | STD ERROR B | F | SIGNIFICANCE | BETA ELASTICITY |
|---|---|---|---|---|---|
| VOL | 5.286719# | 1.#433230 | 25.676443 | .### | .679#968 / .97979 |
| (CONSTANT) | 4.857#45# | 48.182#85 | .1#161857E-#1 | .92# | |

------- VARIABLES NOT IN THE EQUATION -------

| VARIABLE | PARTIAL | TOLERANCE | F | SIGNIFICANCE |
|---|---|---|---|---|
| MAND | .#7713 | .99531 | 8.548#922 | .##7 |

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

| | | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE | F | SIGNIFICANC |
|---|---|---|---|---|---|---|---|
| MULTIPLE R | .764#9 | REGRESSION | 2. | 16#486.8#291 | 8#743.4#646 | 2#.3424# | .## |
| R SQUARE | .58384 | RESIDUAL | 29. | 12#8##9.65584 | 4165.85#2# | | |
| ADJUSTED R SQUARE | .55514 | COEFF OF VARIABILITY | 26.9 PCT | | | | |
| STD DEVIATION | 64.5434# | | | | | | |

------- VARIABLES IN THE EQUATION -------

| VARIABLE | B | STD ERROR B | F | SIGNIFICANCE | BETA ELASTICITY |
|---|---|---|---|---|---|
| VOL | 5.#995#12 | .93477451 | 29.768#6## | .### | .655#481 / .945#9 |
| MAND | 2.7#52999 | .956#79#6 | 8.548#922 | .##7 | .351#645 / .22322 |
| (CONSTANT) | -4#.44#731 | 45.769776 | .78##69325 | .384 | |

------- VARIABLES NOT IN THE EQUATION -------

| VARIABLE | PARTIAL | TOLERANCE | F | SIGNIFICANCE |
|---|---|---|---|---|

ALL VARIABLES ARE IN THE EQUATION.
RETIREMENT PROJECTIONS, 11TH MONTH

FILE NONAME (CREATION DATE = 1#/14/82 )
* * * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * *
DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

1#/14/82    2#.41.16.    PAGE 1#

COEFFICIENTS AND CONFIDENCE INTERVALS.

| VARIABLE | B | STD ERROR B | T | 95.# PCT CONFIDENCE INTERVAL | |
|---|---|---|---|---|---|
| VOL | 5.#995#12 | .93477451 | 5.4553277 | 3.1#76727 : | 7.#113298 |
| MAND | 2.7#52999 | .956#79#6 | 2.9237121 | .83989863 : | 4.75#77#11 |
| CONSTANT | -4#.44#731 | 45.769776 | -.88356847 | -134.#5#44 : | 53.168973 |

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL    .0730#
MAND  -.96122   .9140#
        VOL      MAND

RETIREMENT PROJECTIONS, 11TH MONTH          10/14/82   20.41.16.    PAGE 11

FILE  NONAME  (CREATION DATE = 10/14/82 )
* * * * * M U L T I P L E   R E G R E S S I O N * * * * *
DEPENDENT VARIABLE..   ACCOMP    VOL,MAND,TIME

S U M M A R Y   T A B L E

| STEP | VARIABLE ENTERED | VARIABLE REMOVED | F TO ENTER OR REMOVE | SIGNIFICANCE | MULTIPLE R | R SQUARE | R SQUARE CHANGE | SIMPLE R | OVERALL F | SIGNIFICANCE |
|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1 | VOL | | 25.67644 | .000 | .67910 | .46117 | .46117 | .67910 | 25.67644 | .000 |
| 2 | MAND | | 8.54009 | .007 | .76409 | .58384 | .12267 | .39594 | 20.34240 | .000 |

RETIREMENT PROJECTIONS, 11TH MONTH          10/14/82   20.41.16.    PAGE 12

FILE  NONAME  (CREATION DATE = 10/14/82 )
* * * * * M U L T I P L E   R E G R E S S I O N * * * * *

| OBSERVATION | Y VALUE | Y ESTIMATE | RESIDUAL | -2SD | 0.0 | +2S |
|------|---------|---------|---------|---------|---------|---------|
| 1. | 458.0000 | 384.0654 | 73.93457 | | | |
| 2. | 408.0000 | 258.4282 | 149.5718 | | | |
| 3. | 282.0000 | 249.0601 | 37.93987 | | | |
| 4. | 220.0000 | 230.1354 | -8.135417 | | | |
| 5. | 162.0000 | 161.3864 | .6135917 | | | |
| 6. | 219.0000 | 300.8860 | -81.88604 | | | |
| 7. | 220.0000 | 210.9081 | 9.091875 | | | |
| 8. | 200.0000 | 198.4049 | 1.595079 | | | |
| 9. | 187.0000 | 196.1007 | -9.100770 | | | |
| 10. | 201.0000 | 263.3764 | -62.37643 | | | |
| 11. | 299.0000 | 279.9069 | 19.09306 | | | |
| 12. | 469.0000 | 423.7652 | 45.23483 | | | |
| 13. | 426.0200 | 308.4410 | 117.5590 | | | |
| 14. | 245.0000 | 277.6545 | -32.65557 | | | |
| 15. | 191.0000 | 202.3137 | -11.33371 | | | |
| 16. | 147.0000 | 209.7374 | -62.73741 | | | |
| 17. | 180.0000 | 259.2591 | -79.25913 | | | |
| 18. | 165.0000 | 227.3401 | -62.34012 | | | |
| 19. | 121.0000 | 129.0072 | -8.007204 | | | |
| 20. | 171.0000 | 199.0473 | -28.04731 | | | |
| 21. | 152.0000 | 186.5441 | -34.54411 | | | |
| 22. | 184.0000 | 210.5603 | -26.56032 | | | |
| 23. | 283.0000 | 332.1254 | -49.12544 | | | |
| 24. | 313.0000 | 403.9723 | -90.97233 | | | |
| 25. | 193.0000 | 239.0174 | -46.01742 | | | |
| 26. | 361.0000 | 212.8416 | 148.9584 | | | |
| 27. | 345.0000 | 274.2178 | 70.78217 | | | |
| 28. | 207.0000 | 261.0722 | -54.07223 | | | |
| 29. | 206.0000 | 161.0466 | 44.95340 | | | |
| 30. | 185.0000 | 149.7141 | 35.28589 | | | |
| 31. | 139.0000 | 122.8946 | 16.10548 | | | |
| 32. | 148.0000 | 165.6558 | -17.65580 | | | |

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

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NUMBER OF CASES PLOTTED          32: OR
NUMBER OF 2 S.D. OUTLIERS         2:    6.25 PERCENT OF THE TOTAL

VON NEUMANN RATIO    1.33888      DURBIN-WATSON TEST    1.29697

NUMBER OF POSITIVE RESIDUALS     14.
NUMBER OF NEGATIVE RESIDUALS     18.
NUMBER OF RUNS OF SIGNS          12.

EXPECTED NUMBER OF RUNS OF SIGNS           17.
EXPECTED S.D. OF RUN DISTRIBUTION       2.73751
UNIT NORMAL DEVIATE-
  Z-(EXPECTED-OBSERVED)/S.D.             -1.55251
PROBABILITY OF OBTAINING .GE. ABS(Z)      .06027
1RETIREMENT PROJECTIONS, 11TH MONTH

CPU TIME REQUIRED..      .2218 SECONDS

          FINISH

TOTAL CPU TIME USED..    .2648 SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ  12
NUMBER OF ERRORS DETECTED   0
8

18/14/82    28.41.16.    PAGE  13

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VERSION 8.0 -- JUNE 18, 1979

```
RUN NAME         RETIREMENT PROJECTIONS, 12TH MONTH
VARIABLE LIST    ACCOMP,VOL,MAND,TIME
INPUT MEDIUM     DISK
N OF CASES       30
INPUT FORMAT     FREEFIELD
VAR LABELS       ACCOMP,VOL,MAND,TIME
LIST CASES       CASES=30/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION       METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                 REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                 REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/

STATISTICS       ALL
```

80054480 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 12TH MONTH

FILE NONAME   (CREATION DATE = 10/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	488.	38.	25.	1.
2	222.	36.	22.	3.
3	162.	26.	13.	4.
4	219.	53.	10.	5.
5	220.	36.	7.	6.
6	200.	35.	7.	7.
7	187.	35.	9.	8.
8	201.	49.	14.	9.
9	299.	59.	7.	10.
10	469.	67.	11.	11.
11	426.	36.	19.	13.
12	245.	33.	42.	14.
13	191.	29.	28.	15.
14	147.	25.	22.	16.
15	180.	34.	17.	17.
16	165.	33.	23.	18.
17	121.	22.	8.	19.
18	171.	30.	21.	20.
19	152.	26.	22.	21.
20	184.	26.	16.	22.

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21	283.	49.	22.	23.
22	313.	33.	69.	24.
23	193.	30.	27.	25.
24	361.	27.	23.	26.
25	345.	33.	76.	27.
26	307.	40.	13.	20.
27	206.	25.	22.	29.
28	105.	25.	6.	31.
29	139.	22.	12.	32.
30	148.	23.	21.	33.

1RETIREMENT PROJECTIONS, 12TH MONTH 10/14/82 20.39.39. PAGE 3

1RETIREMENT PROJECTIONS, 12TH MONTH 10/14/82 20.39.39. PAGE 4

FILE NONAME (CREATION DATE = 10/14/82) * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * *

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	231.6133	90.7651	30
VOL	34.5333	11.0477	30
MAND	19.1333	11.0944	30
TIME	17.2333	9.4164	30

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND
VOL	.55999		
MAND	.20770	-.28063	
TIME	-.21002	-.46563	.21094

1RETIREMENT PROJECTIONS, 12TH MONTH 10/14/82 20.39.39. PAGE 5

FILE NONAME (CREATION DATE = 10/14/82) * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * * * * *

0DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

MEAN RESPONSE 231.63333 STD. DEV. 90.76513

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
MULTIPLE R	.55998	REGRESSION	1.	74916.46019	74916.46019	12.79104	.00
R SQUARE	.31357	RESIDUAL	28.	163994.50648	5856.94666		
ADJUSTED R SQUARE	.28905	COEFF OF VARIABILITY	33.0 PCT				
STD DEVIATION	76.53069						

--------- VARIABLES IN THE EQUATION ---------   ------- VARIABLES NOT IN THE EQUATION -----------

| VARIABLE | B | STD ERROR B | F | BETA | | VARIABLE | PARTIAL | TOLERANCE | F |

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	ELASTICITY			F	SIGNIFICANCE
VOL	4.6006558	1.2863724	12.791044	.001	.5599778	MAND	.95976	.39432	4.971048 .034
(CONSTANT)	72.757365	46.568340	2.441026	.129	.68689	TIME	.78319	.06918	.1298 .721

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R	.64831	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.42031	REGRESSION	2.	100415.50046	50207.75023	9.70811	.00
ADJUSTED R SQUARE	.37736	RESIDUAL	27.	138496.46621	5129.46171		
STD DEVIATION	71.62026	COEFF OF VARIABILITY	300.9 PCT				

------- VARIABLES IN THE EQUATION -------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	5.1503417	1.2288211	17.566806	.000	.76784 .6268836		TIME	.01728	.76808	.7764551E-0	.930
MAND	2.7282359	1.2236463	4.971048	.034	.334767						
(CONSTANT)	1.5746220	54.0235.01	.08954658E-03	.977	.22536						

F-LEVEL OR TOLERANCE-LEVEL INSUFFICIENT FOR FURTHER COMPUTATION.

FILE NONAME (CREATION DATE = 10/14/82)
****** M U L T I P L E   R E G R E S S I O N ****** VOL,MAND,TIME
DEPENDENT VARIABLE.. ACCOMP

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
VOL	5.1503417	1.2288211	4.1912869	2.6290091	7.6716742
MAND	2.7282359	1.2236463	2.2295952	.21752108	5.2389506
CONSTANT	1.5746220	54.0235.01	.29146982E-01	-109.27245	112.42169

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MAND
VOL	1.51000	
MAND	.30160	1.49731

FILE NONAME (CREATION DATE = 10/14/82)
*•. • • • • • • • • • • •. M U L T I P L E   R E G R E S S I O N • • • • • • • • •
DEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		12.79184	.001	.55998	.31357	.31357	.55998	12.79184	.001
2	MAND		4.97189	.034	.64031	.42031	.10673	.28770	9.78011	.001

RETIREMENT PROJECTIONS, 12TH MONTH   10/14/82 20.39.39.   PAGE   8

FILE NONAME (CREATION DATE = 10/14/82)
*•. • • • • • • • • • M U L T I P L E   R E G R E S S I O N • • • • • • • • • • • •

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2S
1.	408.0000	265.4935	142.5065			
2.	222.0000	247.0081	-25.0011		I	
3.	162.0000	170.9586	-8.9586		I	
4.	219.0000	301.8251	-82.8256		I	
5.	220.0000	206.0846	13.91543		I	
6.	200.0000	206.0846	-6.084573		I	
7.	187.0000	206.3907	-19.39078		I	
8.	201.0000	292.1367	-91.13667		I	
9.	299.0000	324.5424	-25.54243		I	
10.	469.0000	376.6581	92.34109		I	
11.	426.0000	238.8234	187.1766		I	
12.	245.0000	286.1218	-41.12188		I	
13.	191.0000	227.3251	-36.32513		I	
14.	147.0000	190.3544	-43.35435		I	
15.	180.0000	223.0662	-43.06625		I	
16.	165.0000	234.2053	-69.20532		I	
17.	121.0000	136.7000	-15.70003		I	
18.	171.0000	213.3778	-42.3782		I	
19.	152.0000	195.5447	-43.5447		I	
20.	184.0000	179.1353	4.864721		I	
21.	283.0000	313.9626	-30.96255		I	
22.	313.0000	332.5018	-19.50181		I	
23.	193.0000	229.7472	-36.74724		I	
24.	361.0000	203.3833	157.6167		I	
25.	345.0000	247.4700	102.5300		I	
26.	207.0000	243.0554	-36.05535		I	
27.	206.0000	190.3544	15.64565		I	
28.	185.0000	146.7026	38.29742		I	
29.	139.0000	147.6210	-8.620969		I	
30.	148.0000	177.3254	-29.32543		I	

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   30.   OR   6.67 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS   2.

VON NEUMANN RATIO   1.51183   DURBIN-WATSON TEST   1.46143

NUMBER OF POSITIVE RESIDUALS   9.
NUMBER OF NEGATIVE RESIDUALS   21.
NUMBER OF RUNS OF SIGNS   12.

NORMAL APPROXIMATION TO SIGN DISTRIBUTION IMPOSSIBLE.
USE A TABLE FOR EXPECTED VALUES.

APPENDIX L

RET4 Residual Analysis

RET4 Residual Analysis

SPSS Output

As mentioned before, RET4's Durbin-Watson statistic indicated the possibility of positive autocorrelation. For 32 observations and three variables, D is 1.24 and D is 1.65. Because RET4's Durbin-Watson statistic was calculated to be 1.45, this test was inconclusive Therefore, supplementary evaluation techniques were required. These additional techniques involved time series analysis, residual plot analysis, and a runs test statistic. The results from each analysis are discussed below.

Runs Test. In addition to the Durbin-Watson statistic, SPSS also provides a Runs Test statistic on the residuals. The SPSS output concerning this statistic follows:

```
NUMBER OF POSITIVE RESIDUALS          16
NUMBER OF NEGATIVE RESIDUALS          16

NUMBER OF RUNS OF SIGNS               11

EXPECTED NUMBER OF RUNS OF SIGNS      17
PROBABILITY OF OBSERVED RUNS        2.4%
```

As with the Durbin-Watson Statistic, this nonparametric test also indicated the existence of positive autocorrelation among the residuals. Therefore, positive

autocorrelation could not be ruled out, and additional weight had to be placed upon the other validation techniques.

Residual Plot Analysis

Although Residual Plot Analysis cannot by itself prove or disprove autocorrelation, it can provide insight concerning the existence of additional variables or polynomial terms. Therefore, in hopes of discovering a reason for the possible autocorrelation, residual plots were made of:

1. Time vs. Residuals
2. Accomplished Retirements vs. Residuals
3. Voluntary Retirements vs. Residuals
4. Mandatory Retirements vs. Residuals

These plots are displayed in Figures L-1 through L-4.

Since only the Time vs. Residuals scattergram was found to contain a discernible pattern to the residuals, it was concluded that a polynomial containing a variable currently in the equation was not indicated. Therefore, the Time vs. Residuals scattergram was examined more closely in hopes of discovering a systematic pattern that could be explained by the introduction of another variable. However, due to the limited size of the data base, the validity of additional variables is questionable.

Time vs. Residuals. If the residuals are broken down by fiscal year, a pattern emerges. Figure L-5, displays these

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FIGURE L-1. RET4 Time vs Residuals

FIGURE L-2. RET4 Accomplished Retirements vs Residuals

FIGURE L-3. RET4 Voluntary Retirements vs Residuals

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FIGURE L-4. RET4 Mandatory Retirements vs Residuals

FIGURE I-5. RET4 Time vs Residuals Separated by Fiscal Years

residuals with each fiscal year annotated. As can be seen, FY 80's residuals tend to increase in magnitude as time passes, FY 81's residuals decrease across its time spectrum, and FY 82's residuals are again increasing as the fiscal year progresses.

As mentioned above, hypothesizing a possible explanation as to this occurrence, would be just that, only a hypothesis. However, if one considers the fact that in October 1981 the Armed Services received a 14.3% pay raise (very large in comparison to previous years' pay caps), a possible explanation emerges. That is, those individuals who would have normally submitted their retirement application in late spring, may have delayed their retirement until after the 1 October pay raise or until the following summer in order to capitalize the large pay increase. Therefore, this hypothesis could explain the model's overprediction for July, August, and September 1981, and its underestimate of the October 1981 retirements, as well as the overall shift in the residual pattern which occurred in FY 81. However, it must be remembered that this is merely speculation and cannot be validated statistically. Therefore, no further attempt was made to rectify this residual pattern.

Time Series Analysis. Finally, so that the positive autocorrelation issue could be resolved, a time series analysis using Box and Jenkin's technique was performed.

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First, simple and partial autocorrelations for lags one through sixteen were calculated. Figures L-6 and L-7 display these results. As expected, based upon previous work, all autocorrelations fall well within an approximated 2-standard-error band as calculated using Bartlett's approximation (Ref 2:36-37). Therefore, positive autocorrelation could possibly be ruled out since no significant autocorrelations of the residuals exists.

RET4 Residual Analysis Conclusions. Although the Durbin-Watson statistic implies the possibility of positive autocorrelation, all attempts at either proving or correcting the residual pattern proved fruitless. However, one must remember that, since it could not be completely disproved that positive autocorrelation exists, all associated confidence intervals must be used with an added degree of uncertainty concerning their validity. Since positive autocorrelation destroys the ability to accurately determine the variance associated with the model, any confidence interval associated with predictions may be incorrect. Also, because of the detected residual pattern associated with fiscal years, future use of this methodology should contain an analysis of out-years residual patterns. An additional variable could possibly be added to counteract the increasing or decreasing residual pattern associated with a fiscal year. A copy of the SPSS output associated with this analysis can be found in Appendix M.

FIGURE L-6. RET4 Residual Autocorrelation Plot

FIGURE L-7. RET4 Residual Partial Autocorrelation Plot

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APPENDIX M

RET4's SPSS Regression Output Listing

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

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VERSION 8.0 -- JUNE 18, 1979

```
RUN NAME          RETIREMENT PROJECTIONS, 6TH MONTH
VARIABLE LIST     ACCOMP,VOL,MAND,TIME
INPUT MEDIUM      DISK
N OF CASES        32
INPUT FORMAT      FREEFIELD
VAR LABELS        ACCOMP,VOL,MAND,TIME
LIST CASES        CASES=32/VARIABLES=ACCOMP,VOL,MAND,TIME
REGRESSION        METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
                  REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
                  REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/
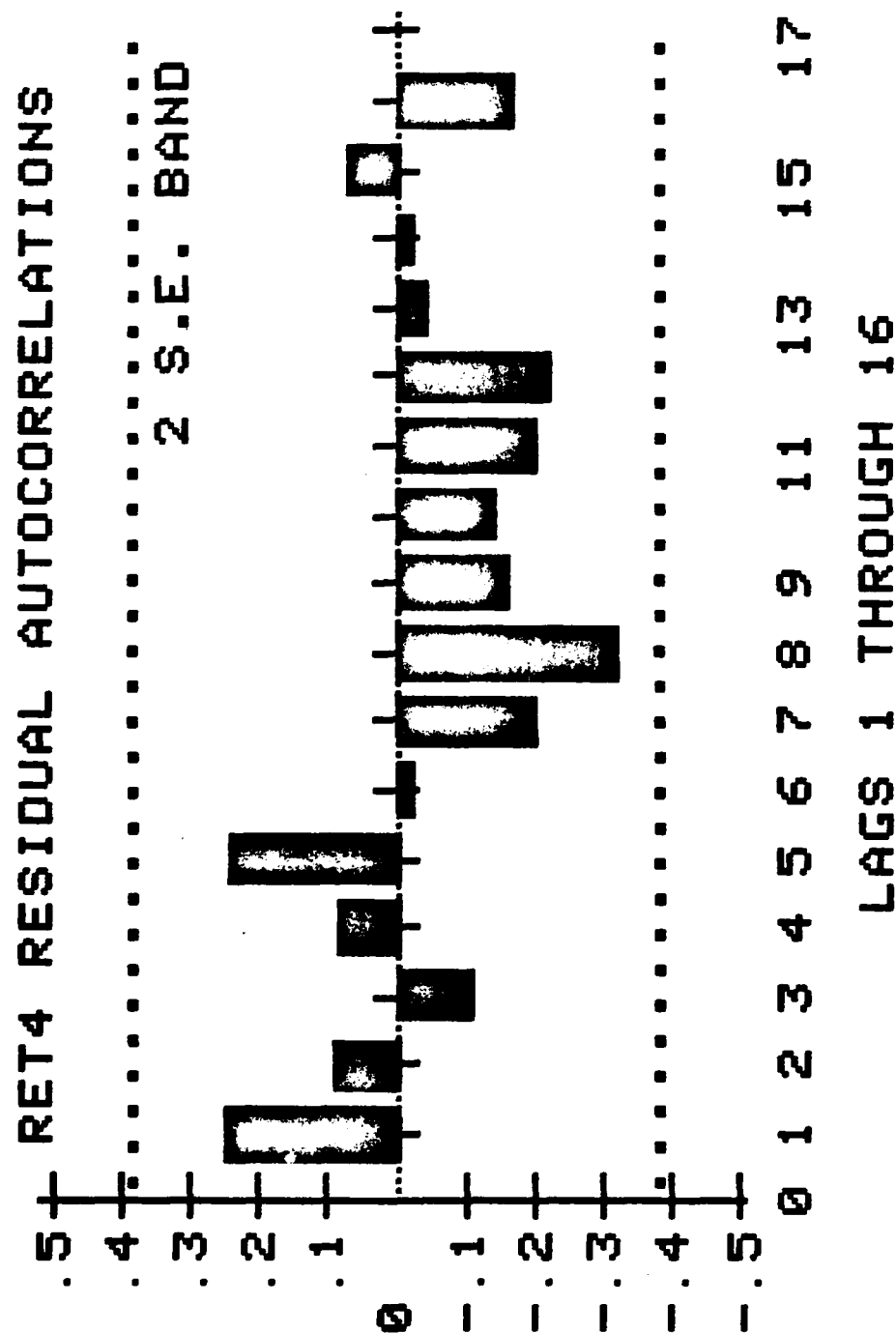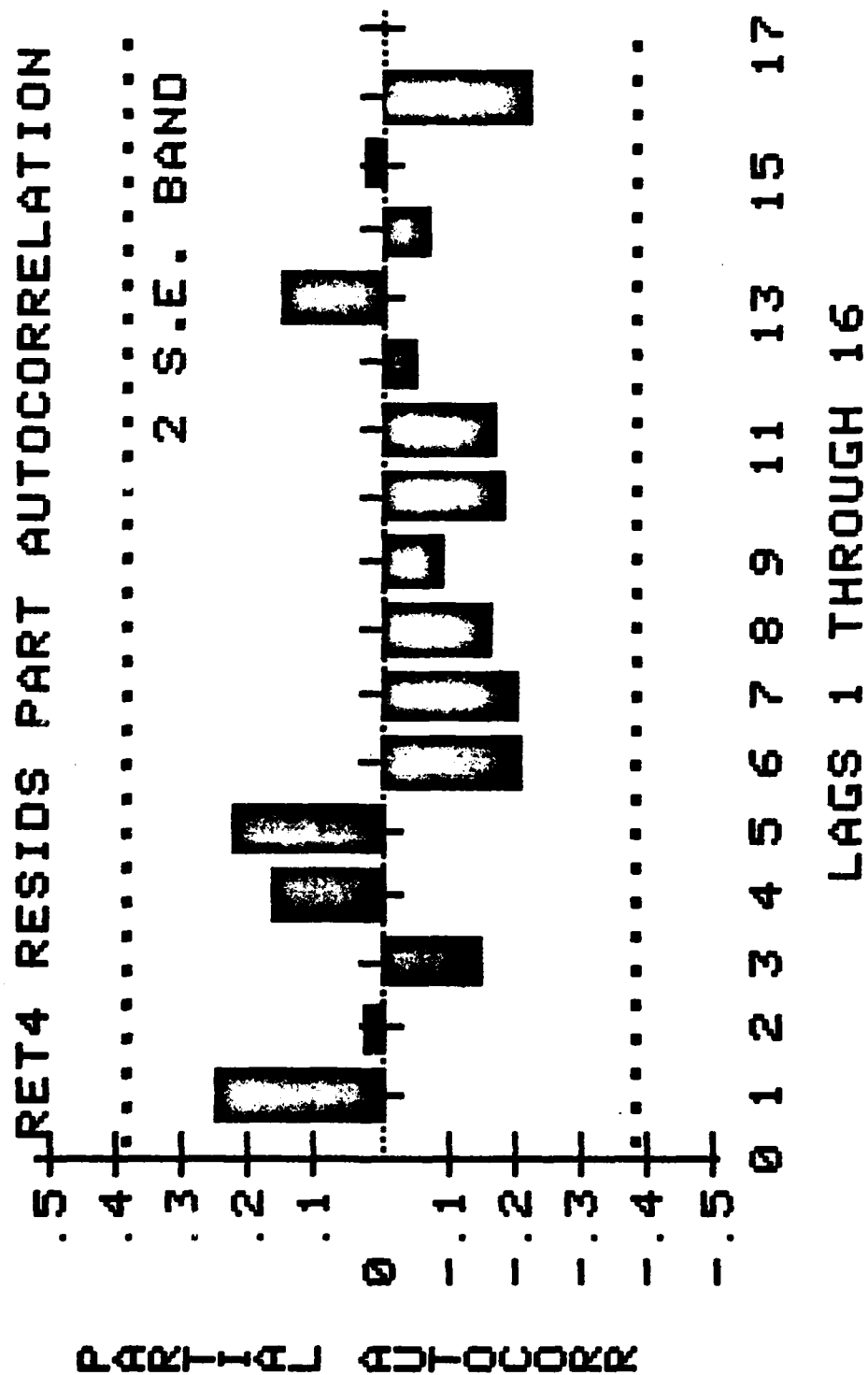
STATISTICS        ALL

00054468 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

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RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME   (CREATION DATE = 08/02/82)

CASE-NO	ACCOMP	VOL	MANU	TIME
1	282.	180.	13.	10.
2	222.	154.	15.	11.
3	162.	110.	18.	12.
4	219.	170.	4.	13.
5	220.	151.	5.	14.
6	200.	114.	18.	15.
7	187.	135.	6.	16.
8	201.	137.	9.	17.
9	299.	225.	18.	18.
10	469.	336.	25.	19.
11	577.	342.	103.	20.
12	426.	311.	9.	21.
13	245.	163.	26.	22.
14	191.	130.	14.	23.
15	147.	99.	13.	24.
16	170.	124.	11.	25.
17	165.	124.	14.	26.
18	171.	93.	4.	27.
19	171.	121.	13.	28.
20	152.	102.	22.	29.
21	184.	137.	12.	30.
22	283.	224.	20.	31.
23	313.	230.	46.	32.
24	193.	140.	21.	33.
25	361.	271.	4.	34.
26	345.	264.	18.	35.
27	207.	156.	13.	36.
28	206.	147.	20.	37.
29	250.	125.	94.	38.
30	185.	127.	9.	39.
31	139.	98.	7.	40.
32	168.	184.	11.	41.

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME   (CREATION DATE = 06/02/82)

. . . . M U L T I P L E   R E G R E S S I O N . . . .

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	239.0625	102.8923	32
VOL	168.1563	76.7038	32
RAND	28.4628	27.6491	32
TIME	25.5000	9.3400	32

CORRELATION COEFFICIENTS.

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	RAND
VOL	.96437		
RAND	.58065	.39784	
TIME	-.15861	-.12874	.09753

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RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME (CREATION DATE = 08/02/82)

08/02/82   12.26.52.   PAGE 5

* * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * *

DEPENDENT VARIABLE.. ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   239.06258   STD. DEV.   102.89235

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

			ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.96837		REGRESSION	1.	307759.98958	307759.98958	451.88192	0
R SQUARE	.93774		RESIDUAL	30.	20431.88542	681.05285		
ADJUSTED R SQUARE	.93567		COEFF OF VARIABILITY	10.9 PCT				
STD DEVIATION	26.09718							

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY
VOL	1.0852731	.46107121E-01	451.88192	.000	.96837 .98047
(CONSTANT)	2.7578062	12.035610	.52474932E-01	.828	

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
MAND	.85660	.84232	79.39631	0
TIME	-.13713	.98393	.55627195	.462

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

			ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
MULTIPLE R	.99167		REGRESSION	2.	322745.10705	161372.55352	854.18.17	.000
R SQUARE	.98340		RESIDUAL	29.	5446.76795	187.81951		
ADJUSTED R SQUARE	.98226		COEFF OF VARIABILITY	5.7 PCT				
STD DEVIATION	13.70473							

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA ELASTICITY
VOL	.83711888	.37825731E-01	1129.2504	0	.75918 .89918
MAND	.86508691	.96858186E-01	79.784634	0	.23228 .07687
(CONSTANT)	7.6180965	6.8457191	1.4372562	.240	

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
TIME	-.54742	.95649	12.605134	.002

332

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME (CREATION DATE = 08/02/82)

. . . . M U L T I P L E   R E G R E S S I O N . . . .

DEPENDENT VARIABLE.. ACCOMP   VOL,RAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

		ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE		
MULTIPLE R	.99918	REGRESSION	3.	324379.69361	108126.56447	F 794.17613	SIGNIFICANCE 0
R SQUARE	.98838	RESIDUAL	28.	3812.18159	136.10734		
ADJUSTED R SQUARE	.98714	COEFF OF VARIABILITY	4.9 PCT				
STD DEVIATION	11.66431						

------------- VARIABLES IN THE EQUATION -------------   ------- VARIABLES NOT IN THE EQUATION -------

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY		VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	1.2581894	.32766847E-01	1055.8025 .000	.9615034					
RAND	.91304136	.83612254E-01	119.24522 .000	.8793?					
TIME	-.79148659	.22842672	12.005434 .002	-.0721607					
(CONSTANT)	38.329426	8.4949884	12.747111 .001						

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	1.2581894	.32766847E-01	38.154748	1.1430711 : 1.3173077
RAND	.91304136	.83612254E-01	10.919946	.74176941 : 1.0843133
TIME	-.79148659	.22842672	-3.4649435	-1.2593477 : -.32357505
CONSTANT	38.329426	8.4949884	3.5783847	12.929411 : 47.730440

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	RAND	TIME
VOL	.00107		
RAND	-.00114	.00693	
TIME	.00158	-.00316	.05218

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME (CREATION DATE = 08/02/82)

08/02/82   12.26.59.   PAGE 7

. . . . M U L T I P L E   R E G R E S S I O N . . . .

DEPENDENT VARIABLE..   ACCOMP   VOL,RAND,TIME

S U M M A R Y   T A B L E

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL	451.00132	0	.96837	.93774	.93774	.96837	451.00132	0
2	RAND	79.78464	0	.99167	.98340	.04566	.58065	859.38417	.000
3	TIME	12.08593	.002	.99418	.98838	.00498	-.15961	736.17612	3

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RETIREMENT PROJECTIONS, 9TH MONTH

FILE NONAME   (CREATION DATE = 08/02/82)

. . . .   M U L T I P L E   R E G R E S S I O N . . . .

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	242.0000	230.5699	11.43010			
2.	222.0000	227.8479	-5.847644			
3.	162.0000	167.4428	-5.442237			
4.	219.0000	236.2245	-17.22447			
5.	220.0000	221.3437	-1.343747			
6.	200.0000	170.1091	29.89046			
7.	117.0000	181.9175	-0.919461			
8.	201.0000	196.3675	4.632422			
9.	299.0000	306.5057	-7.505700			
10.	467.0000	458.1807	10.81914			
11.	577.0000	572.6294	4.370611			
12.	425.0000	418.2356	7.764375			
13.	245.0000	240.4367	4.563327			
14.	191.0000	187.4324	3.567560			
15.	147.0000	146.9720	.2795909-01			
16.	170.0000	175.6042	4.390773			
17.	165.0000	177.5568	-12.55644			
18.	121.0000	128.8791	-7.879073			
19.	171.0000	171.3103	-.3102622			
20.	152.0000	154.5925	-2.592563			
21.	184.0000	188.8173	-4.817277			
22.	213.0000	309.0366	-21.07660			
23.	313.0000	334.5453	-21.54533			
24.	193.0000	204.4123	-15.61224			
25.	361.0000	347.5245	11.47565			
26.	305.0000	349.1121	-4.112169			
27.	207.0000	208.7350	-1.735000			
28.	206.0000	203.0431	2.916301			
29.	270.0000	266.1031	3.896326			
30.	195.0000	180.4527	14.54712			
31.	139.0000	127.5758	11.42018			
32.	148.0000	142.3424	5.057606			

NOTE - (•) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
        R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   32.
NUMBER OF 2 S.D. OUTLIERS   1. OR   3.13 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.49637   DURBIN-WATSON TEST   1.44961

NUMBER OF POSITIVE RESIDUALS   16.
NUMBER OF NEGATIVE RESIDUALS   16.
NUMBER OF RUNS OF SIGNS   11.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.78243
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   -1.97669
PROBABILITY OF OBTAINING .GE. ABS(Z)   .02404

RIVERFRONT PROJECTIONS: 4TH MONTH   08/02/82   12:26:5?   PAGE ?

FILE NONAME   (CREATION DATE = 08/02/82)

. . . . M U L T I P L E   R E G R E S S I O N . . . .

DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

MEAN RESPONSE   235.86250   STD. DEV.   102.69235

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R   .96837   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANCE
R SQUARE   .93774   REGRESSION   1.   307759.98958   307759.98958   451.86112   0
ADJUSTED R SQUARE   .93567   RESIDUAL   30.   20431.88542   681.06245
STD DEVIATION   26.09718   COEFF OF VARIABILITY   10.9 PCT

------------ VARIABLES IN THE EQUATION ------------   ------------ VARIABLES NOT IN THE EQUATION ------------

VARIABLE   B   STD ERROR B   BETA   F   VARIABLE   PARTIAL   TOLERANCE   F
                                              ELASTICITY SIGNIFICANCE   SIGNIFICANCE

VOL   1.0052731   .66107121E-01   .96837   451.86192   MAND   .23600   .04932   79.24653
                                              .98847   0   0
(CONSTANT) 2.7570462   12.035610   .5297493E-03
                                                            .820

. . . .

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R   .99167   ANALYSIS OF VARIANCE   DF   SUM OF SQUARES   MEAN SQUARE   F   SIGNIFICANCE
R SQUARE   .98340   REGRESSION   2.   322745.10705   161372.55352   818.18817   .000
ADJUSTED R SQUARE   .98226   RESIDUAL   29.   5446.76735   197.81954
STD DEVIATION   13.70473   COEFF OF VARIABILITY   5.7 PCT

------------ VARIABLES IN THE EQUATION ------------   ------------ VARIABLES NOT IN THE EQUATION ------------

VARIABLE   B   STD ERROR B   BETA   F   VARIABLE   PARTIAL   TOLERANCE   F
                                              ELASTICITY SIGNIFICANCE   SIGNIFICANCE

VOL   1.2711000   .37825731E-01   .87591189   1129.2504
                                              .87918   0
MAND   .86500691   .96458106E-01   .232-244   79.78463R
                                              .07007   0
(CONSTANT) 7.6184965   6.3437121   1.4372562
                                                            .240

ALL VARIABLES ARE IN THE EQUATION.

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NONAME (CREATION DATE = 08/02/82)

. . . . M U L T I P L E   R E G R E S S I O N . . . .

DEPENDENT VARIABLE..   ACCOMP   VOL,MANO,TIME

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
VOL	1.2711848	.37825731E-01	33.604321	1.1937457	:	1.3484703
MANO	.86508691	.96450186E-01	8.9322247	.66780620	:	1.0631676
CONSTANT	7.6108965	6.3637191	1.1996900	-5.3638659	:	20.584457

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

	VOL	MANO
VOL	.00103	
MANO	-.00105	.00934

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RETIREMENT PROJECTIONS, 4TH MONTH   06/02/82   12.26.57.   PAGE 11

FILE NONAME   (CREATION DATE = 06/02/82)

. . . .   M U L T I P L E   R E G R E S S I O N . . . .

DEPENDENT VARIABLE..   ACCOMP   VOL,MAND,TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		451.88172	0	.96837	.93774	.93774	.96937	451.88192	0
2	MAND		79.78464	0	.99167	.98340	.04566	.58255	859.18017	.000

MULTIPLE REGRESSION

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-250	0.0	250
1.	282.0000	259.0964	22.90326			
2.	222.0000	216.3374	5.662567			
3.	162.0000	156.0432	5.916754			
4.	217.0000	227.1512	-8.159205			
5.	220.0000	212.7710	7.229004			
6.	200.0000	161.1677	38.83232			
7.	187.0000	184.4006	2.597401			
8.	201.0000	189.5341	11.46192			
9.	99.0000	102.2607	-3.260467			
10.	463.0000	457.3308	12.67004			
11.	577.0000	566.0369	10.96314			
12.	426.0000	418.3375	7.662483			
13.	245.0000	237.2734	7.706437			
14.	151.0000	184.965A	6.034296			
15.	147.0000	144.6963	2.303601			
16.	165.0000	177.3371	-12.33711			
17.	121.0000	129.2839	-8.283449			
18.	171.0000	172.66	-1.660695			
19.	152.0000	154.275	-4.235925			
20.	184.0000	192.1333	-8.133336			
21.	273.0000	304.6404	-26.64063			
22.	193.0000	213.7523	-20.75034			
23.	193.0000	213.7013	-20.70131			
24.	361.0000	359.0015	1.998538			
25.	345.0000	358.7546	-13.75457			
26.	207.0000	217.1495	-10.14998			
27.	204.0000	211.7651	-5.765112			
28.	250.0000	251.6305	-1.630491			
29.	165.0000	176.8278	8.173004			
30.	139.0000	138.2347	.7653100			
31.	144.0000	156.4061	-6.406117			

NOTE - (•) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
       R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED   32.
NUMBER OF 2 S.D. OUTLIERS   1. OR   3.13 PERCENT OF THE TOTAL

VON NEUMANN RATIO   1.02811   DURBIN-WATSON TEST   .99598

NUMBER OF POSITIVE RESIDUALS   17.
NUMBER OF NEGATIVE RESIDUALS   15.
NUMBER OF RUNS OF SIGNS   18.

EXPECTED NUMBER OF RUNS OF SIGNS   17.
EXPECTED S.D. OF RUN DISTRIBUTION   2.77128
UNIT NORMAL DEVIATE-
Z=(EXPECTED-OBSERVED)/S.D.   -2.32388
PROBABILITY OF OBTAINING .GE. ABS(Z)   .01009

APPENDIX N

Retirement's Time Series Computer Output

HOW LONG IS THE TIME SERIES?69
ENTER TITLE BET ANALYSIS
DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?N
RET ANALYSIS
MEAN = 2.24376811594942 VARIANCE = .888281454761

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y

LAG	AUTOCOVARIANCE	AUTOCORRELATION	PARTIAL AUTOCORRELATION
1	.635613	.715554X	.715554
2	.301524	.339619X	-.339619
3	-.007425	-.008359	-.197018
4	-.200763	-.226013	-.054347
5	-.302293	-.340313X	-.126723
6	-.295004	-.332107X	-.014266
7	.291965	.328685X	.225190
8	.216509	.244189X	.050130
9	.074640	.084028	.097942
10	.162127	.132517	.261487
11	.419314	.472051X	.312394
12	.577404	.650023X	.172752
13	.465496	.524041X	.203121
14	.249224	.280568X	.032580
15	-.005050	-.005685	.051954
16	-.191569	-.215663	.020779
17	-.307048	-.345665X	.079845
18	-.320189	-.360459X	.012191
19	-.339523	-.382225X	.143909
20	-.297519	-.334937X	.071958
21	-.184629	-.207849	.027869
22	.002175	.002448	.104558
23	.192830	.217082	.061611
24	.315242	.354890X	.100163
25	.251550	.283187X	.168676
26	.069928	.076723	.216749
27	-.082033	-.092350	.101229
28	-.202908	-.226176	.088332
29	-.274423	-.308937X	.077639
30	-.281797	-.317238X	.066695
31	-.265483	-.298373X	.072450
32	-.230077	-.259013X	-.009239
33	-.129375	-.145647	.081000
34	-.019205	-.021620	.099782

THE APPROXIMATED 2 S.E. BAND IS +/-   .2408

X-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

LW= 6S
HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
0 - DEFAULT OF 45; N .LT. LW/2 -->34

I	FQ	P	INTNCTY
1	.014	69.000	8.322
2	.029	34.500	.299
3	.043	23.000	.059
4	.058	17.253	2.076
5	.072	13.800	8.584
6	.087	11.500	24.546
7	.101	9.957	.478
8	.116	8.625	1.632
9	.130	7.667	1.193
10	.145	6.900	.358
11	.159	6.273	4.934
12	.174	5.750	3.195
13	.188	5.308	.012
14	.203	4.929	.488
15	.217	4.600	.334
16	.232	4.313	.371
17	.246	4.059	.762
18	.261	3.833	.094
19	.275	3.632	.385
20	.290	3.450	.291
21	.304	3.286	.116
22	.319	3.136	.064
23	.333	3.000	.896
24	.348	2.875	.023
25	.362	2.760	.260
26	.377	2.654	.074
27	.391	2.556	.154
28	.406	2.464	.072
29	.420	2.379	.206
30	.435	2.300	.010
31	.449	2.225	.241
32	.464	2.156	.044
33	.478	2.091	.170
34	.493	2.029	.550

AVERAGE INTENSITY=   1.80268883315

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RET ANALYSIS

AUTOCORRELATION PLOT

-.787 ──────────────────────────0──────────────────────── .787

LAG
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RET ANALYSIS

PARTIAL AUTOCORRELATION PLOT

DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?Y
WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE(ID1)=00
WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING(ID2)=01
TRANSFORMATION COEFF: IP=0 (LN),IP>0(Z(I)xxIP)1
LENGTH OF SEASON: IS)=012
MEAN = .045964128069 VARIANCE = .5048566478916

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y

LAG	AUTOCOVARIANCE	AUTOCORRELATION	PARTIAL AUTOCORRELATION
1	.310075	.614186	.614186x
2	.168447	.333055x	-.069962
3	.095505	.189174	.020784
4	.072312	.143233	.054524
5	.067372	.133449	.041761
6	.076573	.151674	.009790
7	.090526	.179311	.073302
8	.069718	.138095	.035263
9	.014810	.029334	-.103391
10	.024887	.049296	.115579
11	.049866	.096791	.049072
12	-.004822	-.009550	-.198752
13	.040799	.080812	.250592
14	.087472	.172262	.078544
15	.042373	.085119	-.211842
16	-.012776	-.025307	-.022589
17	-.029457	-.058347	.036920
18	-.022392	-.044353	.071511
19	.031996	.063377	-.038374
20	.032634	.064640	.044441
21	-.045843	-.090803	-.209197
22	-.066532	-.096239	.056239
23	-.164196	-.325233x	.098779
24	-.163297	-.323454x	-.142934
25	-.102956	-.203932	.117201
26	-.114062	-.225931	-.107590
27	-.066500	-.131721	.071719
28	-.038272	-.075808	-.013036

THE APPROXIMATED 2 S.E. BAND IS +/-   .2649

x-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

LW= 57
HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
0 = DEFAULT OF 45; N.LT. LW/2 ..>28

N	FQ	P	INTNCTY
1	.018	57.000	6.073
2	.035	28.500	.755
3	.053	19.000	1.742
4	.070	14.250	3.137
5	.088	11.400	.668
6	.105	9.500	2.168
7	.123	8.143	.387
8	.140	7.125	2.731
9	.158	6.333	1.168
10	.175	5.700	.671
11	.193	5.182	.694
12	.211	4.750	.833
13	.228	4.385	.430
14	.246	4.071	.120
15	.263	3.800	.131
16	.281	3.563	1.680
17	.298	3.353	.141
18	.316	3.167	.024
19	.333	3.000	.033
20	.351	2.850	.170
21	.368	2.714	.783
22	.386	2.591	.055
23	.404	2.478	.230
24	.421	2.375	.105
25	.439	2.280	.234
26	.456	2.192	.327
27	.474	2.111	.197
28	.491	2.036	.148

AVERAGE INTENSITY=   1.027741854E

$$(F(R) = ((-1)**M)*ACF(R))$$

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	-.0851	-.0896	-.0659	.0391	-.0108	.0634	.0063	.0370	.0857	.0452
(-14)	.1733	.0322	-.1273	-.0574	.0406	.0004	.0067	-.0250	-.0696	-.0606
(-13)	-.0808	.1085	.3456	.1444	.0469	.0061	.0312	.1245	.0640	.5620
(-12)	-.0096	.1129	.0822	.0120	.0261	-.0180	.0008	.1195	.0502	.0026
(-11)	-.0493	.0028	.0765	-.0346	.0097	.0091	.1339	.0975	.2219	.2989
(-10)	-.0293	.0756	.0061	.0036	-.0124	-.0067	-.0146	.0990	.2800	-1.7940
(-9)	-.1381	-.0825	.0170	.0102	.0158	.0640	.1102	.1488	.3396*	-.3747*
(-8)	-.1793	.0353	.0155	-.0092	.0449	.9285	.1758	.3520*	.0351	-.0433
(-7)	.1517	.0228	.0030	.0702	.0234	.5311	.1879	.0124	.0370	.2851
(-6)	-.1334	.0137	.0094	.0471	.2831	.2281	.3798*	.0764	.0107	.0043
(-5)	.1432	.0171	.0187	.0738	.1578	.3550*	.0278	.0179	.0159	.0263
(-4)	-.1892	.0361	.0393	.2583	.3705*	.0248	.0200	.0155	.0286	.1658
(-3)	.3337	.0293	-.1473	.3514*	.0155	.0060	-.0139	.0156	.0092	.0221
(-2)	-.6142	.0460	.3588*	.0192	.0077	.0206	.0132	.0248	.0562	.0324
(-1)	1.0000*	.3858*	.0075	.0102	-.0030	.1305	-.0017	.0255	.0003	.0000
(0)	-.6142	.0270	.0301	.0034	.0827	.0030	-.6247	.0398	.0032	.0000
(1)	.3337	.0051	.0153	.0040	.0339	-.0125	-.0325	.0030	.0000	.0000
(2)	-.1892	.0230	.0050	.2120	.0252	.0175	-.0343	.0000	.0000	.0000
(3)	.1432	.0142	.0245	.0161	.0295	.0105	.0000	.0000	.0000	.0000
(4)	-.1334	.0032	.0287	.0816	.0269	.0005	.0000	.0000	.0000	.0000
(5)	.1517	.0339	.0405	-.0276	.0339	.0348	.0000	.0000	.0000	.0000
(6)	-.1793	.0435	.0411	.0030	.0005	.1016	.0000	.0000	.0000	.0000
(7)	-.1381	.0355	.4547	.0426	.0125	.0000	.0000	.0000	.0000	.0000
(8)	-.0293	.0552	.0651	.1548	.0779	.0000	.0000	.0000	.0000	.0000
(9)	.0493	.6674	.0668	.0790	.0000	.0000	.0000	.0000	.0000	.0000
(10)	-.0568	.0326	.7770	.0771	.0000	.0000	.0000	.0000	.0000	.0000
(11)	-.0096	.1149	.1781	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(12)	-.0808	-.0911	.0551	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	.1733	.0456	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	-.0293	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	-.0951	.0000	.0223	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)	-.0253	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-3.0355	1.9939	-1.9422	3.3194	10.8824	6.0693	7.3108	10.6427	46.8636
(-14)	1.0000	-1.4664	-2.0876	-1.3453	3.9436	-6.1106	94.5940	-32.8456	-25.8201	77.2212
(-13)	1.0000	-.8818	.3621	-1.1218	2.8354	-6.1665	-9.0562	-6.4876	-40.2976	4.0414
(-12)	1.0000	9.1348	1.4718	-3.0929	13.8891	-4.7127	6.6596	1003.0777	-18.7278	49.3124
(-11)	1.0000	-1.5093	44.6362	-3.5791	-3.4376	-13.4637	6.0716	101.6713	-9.0918	67.6564
(-10)	1.0000	-1.5951	-.5171	-3.3745	-47.9042	-23.3277	-114.2060	577.4445	-29.4658	-2.6396
(-9)	1.0000	-5.7076	3.2824	-3.2462	10.2633	-13.3959	-88.1377	-58.6438	27.4962	-15.5650x
(-8)	1.0000	-2.2985	11.6999	-5.3852	-7.2489	5.6795	-98.6018	-9.0052	50.8993x	-1.6093x
(-7)	1.0000	-1.8459	4.6538	.8429	-11.0841	230.5784	-131.2182	-23.6516x	1.7948x	.3757
(-6)	1.0000	-1.8798	7.2233	7.1154	-5.9641	91.8127	-23.1451x	-1.7337x	6.8717	-2.5167
(-5)	1.0000	-2.6733	3.4756	-10.7606	-77.9540	-41.5822x	1.6153x	-.9608	3.5395	-3.5297
(-4)	1.0000	-2.3207	-11.1937	-30.8364	-30.5714x	-1.7355x	1.4303	-4.6212	1.4286	2.3038
(-3)	1.0000	-2.7637	-24.6866x	-84.8261x	1.6669x	-4.5173	14.9612	-10.5838	8.3720	-11.0524
(-2)	1.0000x	-2.8408	1.2499	-1.7630x	3.0132	-1.0301	12.3910	-91.6473	2.8750	-37.7193
(-1)	1.0000	-2.6323	1.2499	-6.2020	.6819	20.0253	12.1992	12.7506	5.2847	-15.9604
(0)	1.0000x	-1.6142x	8.5794	-4.2039	1.0035	-11.5926	2.2989	200.8207	16.9373	0.0000
(1)	1.0000	-1.5432	3.8532	-1.9121	21.8769	-13.6302	-11.2020	-6.6126	15.5577	0.0000
(2)	1.0000	-1.5670	2.6258	-.4027	17.8556	-32.1127	-12.8278	35.3347	0.0000	0.0000
(3)	1.0000	-1.7571	-20.6192	-19.3329	7.6334	-13.1099	8.4358	-26.8855	0.0000	0.0000
(4)	1.0000	-1.9317	.2227	-8.1507	146.3703	-8.0156	-492.5260	0.0000	0.0000	0.0000
(5)	1.0000	-2.1366	3.0733	-8.1507	3.5472	-7.8859	-6.4408	0.0000	0.0000	0.0000
(6)	1.0000	-2.1822	-35.3838	-2.6353	-10.0383	-3.3531	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-2.9635	-.2845	-2.6331	-4.2263	23.2827	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-1.9813	2.2103	-.9117	4.5682	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	7.4617	5.6370	-3.0245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-3.1440	2.2282	-2.7169	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-1.4913	0.0000	-3.8935	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-.7027	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(1,0)

(F(M) = ACF(M))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	.0851	-.2625	.1843	-.1005	-.0559	-.1935	.0713	.1731	-17.7417	.4191
(-14)	.1733	.0885	.1209	-.6044	.2285	.6048	.0864	.1750	-.3494	4.6434
(-13)	.0808	-.0856	.1379	-.3747	-.1179	-.0724	-.1978	-.4895	-.4048	-.2151
(-12)	-.0096	-.0925	.2719	-.0362	-.1421	-.3293	-.0094	-1.3603	-.1141	-.4353
(-11)	-.0963	-.0086	.2513	-.1408	-1.4386	-.6166	1.3973	-.3967	-.2420	-.7725
(-10)	.0493	.2979	.1473	-.0566	-.9717	.4835	.7416	.9651	.9582	-.9335
(-9)	.0293	-.1270	.1640	1.3091	1.0284	-1.7989	-7.3527	3.9651	2.9901	-1.6720$
(-8)	.1381	.2719	.1947	.2547	.4106	-3.2754	4.8427	-1.3132	1.8648$	.1933
(-7)	.1793	-.0334	-.1364	-.1057	.1218	-2.9386	15.3016	-.6133	-.1928	-.1483
(-6)	.1517	-.2149	-.1844	-.3800	3.3065	-3.7969	1.6010$	-1.9330$	-.4258	.0111
(-5)	.1334	-.4834	.9182	-1.5235	-6.4353	-1.6835$	.1320	.0682	-.0356	-.1384
(-4)	-.1432	.2613	.2051	-2.3960	1.6160$	-.1175	.6326	.1533	-.0173	-.0635
(-3)	-.1892	.0337	.3494	-1.5325$	.0675	-.0993	.3186	-.1577	.0650	-1.6921
(-2)	-.3337	-.1553	1.5013$	-.0836	.3166	-.4459	-.1348	.6106	-.0579	-.3004
(-1)	.6142	-1.6142$	.0312	-.0926	.0151	-.4605	-.6684	.4445	-.6713	0.0000
(0)	1.0300$	-.1129	.0714	-.1742	.4293	.1922	.0178	-.3049	0.0000	0.0000
(1)	.6142	-.0173	-.0801	.8321	.3554	.8998	-.2886	-.2735	0.0000	0.0000
(2)	.3337	-.0831	-.2467	.3189	.6009	-.0958	-.0958	-.2682	0.0000	0.0000
(3)	.1892	.1029	.0281	-.4434	-2.3177	.1917	-.4174	0.0000	0.0000	0.0000
(4)	.1432	-.4003	.4396	2.4069	-1.0418	.0065	.3913	0.0000	0.0000	0.0000
(5)	.1334	.0507	.5093	-.0360	.1847	-.3893	0.0000	0.0000	0.0000	0.0000
(6)	.1517	-.4055	.3961	-.1281	.1521	-.3102	0.0000	0.0000	0.0000	0.0000
(7)	.1793	.3351	.1105	.4016	-.0704	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	.1301	.0547	.2139	.8318	.4032	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	.0293	-.0205	.2210	-.1983	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	.0493	-.2072	.3100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	.0968	.0727	.1651	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	-.0396	.0906	.1539	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	-.0808	-.2503	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	-.1733	.1319	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	.0851	.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	-.0253	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	.0000	1.0355	.7135	-.7568	-.6412	3.5643	-.5323	1.5624	.0514	5.0574
(-14)	1.0000	-.5336	2.1986	-.1278	-.7005	.5459	7.3757	4.6935	-5.1530	-1.0082
(-13)	1.0000	-1.1182	-.9076	-.4324	-.1276	.5237	-1.4263	.5424	-6.3693	10.5583
(-12)	1.0000	-1.1348	.4450	1.0284	2.5478	.2570	-.5693	86.8555	-8.2370	-9.3531
(-11)	1.0000	-.4947	-13.5951	.8804	.0231	.1982	-.5779	1.0550	-8.3369	-26.1741
(-10)	1.0000	-.4249	-2.1274	.0386	-.6107	.3239	-2.2481	14.4230	8.8458	-5.0711
(-9)	1.0000	3.7076	-.3407	.0253	-.1574	.4762	-1.3214	6.6451	-2.3913	-3.4079X
(-8)	1.0000	-.2985	-.1352	-.1954	-.7028	-1.6100	-1.2877	4.4866	9.2682X	-.3636X
(-7)	1.0000	-.1541	-.6521	.5624	2.2056	-1.6997	1.6110	4.3068X	-.3157X	-.7221
(-6)	1.0000	-.1202	-.2383	.8815	2.5552	5.5155	-.3407X	-.4787	-.5976	-.0736
(-5)	1.0000	.0733	-.1474	.5167	-1.5017	8.7656X	-.0421	-.5236	1.0626	-.6695
(-4)	1.0000	.3207	-.6654	-3.3209	-7.0694X	-.3662X	-.6506	-.2644	-1.3027	-6.0187
(-3)	1.0000	.7637	-4.7208	19.4490X	.3822X	.2714	-.1858	.9510	1.2062	-.1443
(-2)	1.0000	.8408	5.0004X	-.4042X	.0735	.1863	.2401	-1.1041	1.3232	4.0765
(-1)	1.0000	.6282X	.4128X	.6783	-.1778	5.6767	1.0755	16.7213	1.0559	.2770
(0)	1.0000	-.3858X	.5269	-.2019	.1932	.4121	1.0967	-.9449	.0818	.0000
(1)	1.0000	-.4568	-1.6424	-.2369	2.3926	-.1893	.8303	-7.5512	.2789	.0000
(2)	1.0000	-.4330	.0591	.2677	-.2739	-.4727	.6578	-2.6097	.0000	.0000
(3)	1.0000	-.2429	.1973	-.7015	.9839	-.7149	43.1996	.0000	.0000	.0000
(4)	1.0000	.0683	-.1539	.0662	-.6586	-.6807	-.2233	.0000	.0000	.0000
(5)	1.0000	.1366	-1.6307	.0933	3.9923	-.7045	.0000	.0000	.0000	.0000
(6)	1.0000	.1822	.4198	-.6605	-.7508	1.0982	.0000	.0000	.0000	.0000
(7)	1.0000	-.2299	.9161	.9755	-.8824	5.9361	.0000	.0000	.0000	.0000
(8)	1.0000	-.7876	-.9356	-.3514	-1.3102	.0000	.0000	.0000	.0000	.0000
(9)	1.0000	-.6805	.7131	.2873	-.6583	.0000	.0000	.0000	.0000	.0000
(10)	1.0000	.9635	-10.6984	1.6583	1.0000	.0000	.0000	.0000	.0000	.0000
(11)	1.0000	-1.0087	.7131	-.1810	.0000	.0000	.0000	.0000	.0000	.0000
(12)	1.0000	-9.4617	-2.3279	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	1.0000	-.5087	2.0172	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	1.0000	.1440	.7769	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	1.0000	-1.2973	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

APPENDIX O

Residual Analysis of Retirement Data

using an ARIMA(1,0,0)*(0,1,0)$_{12}$ Model

THIS PROGRAM GENERATES THE RESIDUALS FOR RET RET ANALYSIS
MODEL CHOSEN IS ARIMA(1,0,0)x(0,1,0)12

MEAN=-.00976450836114   VARIANCE=-.31382210058134

LAG	AUTOCOV.	AUTOCORR.	PART.AUTOCORR.
1	.014287	.045527	.045527
2	-.018476	-.053875	-.061074
3	-.016545	-.052722	-.047372
4	-.000259	-.000825	-.000267
5	.001398	.004453	.003421
6	.006808	.021694	.019178
7	.035374	.112721	.111967
8	.031444	.103197	.094731
9	-.038032	-.121191	-.117104
10	.006636	-.021153	.010672
11	.056603	.180594	.104898
12	-.057612	-.162582	-.231431
13	.002929	.009334	.050095
14	.067202	.214159	.236371
15	.010793	.034331	.061044
16	-.023074	-.085457	-.083775
17	-.020637	-.065760	.034073
18	-.006516	.020763	.033678
19	-.010930	-.034828	-.090803
20	.001648	.005252	-.124523
21	.009316	.029595	-.074150
22	-.011189	-.035654	-.087448
23	-.073160	-.233124	-.065524
24	-.061566	-.196244	-.235325
25	.028179	.089792	.019278
26	-.051000	-.162798	-.131257
27	-.001449	.004618	-.082340
28	.031982	.036315	-.071740

22	.386	.825
23	.404	.856
24	.421	.871
26	.439	.904
27	.456	.958
28	.491	1.000

UNCONDITIONAL SUM OF SQUARES FOR A= 17.89585B(1036
UNCONDITIONAL SUM OF SQUARES FOR E= 17.89585801026

PORTMANTEAU LACK OF FIT TEST = 17.31044688707

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE

1	.018	.079
2	.035	.087
3	.053	.108
4	.070	.154
5	.088	.167
6	.105	.215
7	.123	.226
8	.140	.316
9	.158	.363
10	.175	.394
11	.193	.431
12	.211	.480
13	.228	.509
14	.246	.519
15	.263	.534
16	.281	.682
17	.298	.695
18	.316	.697
19	.333	.701
20	.351	.722
21	.368	.818

APPENDIX P

Copy of TS (Time Series) Analysis Program

```
      PROGRAM TS(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1)
      COMMON AC(51)
      COMMON LU
      COMMON NAC
      INTEGER NAC,NPAC
      CHARACTER IUK(80),IWHAT
      CHARACTER TIT=EX20
      REAL R(40,40),S(40,40),Z(368),ACU(50),PACU(50)
      REAL UK(50)
      CHARACTER A(-50:50)
      REAL N
      REAL CC
      CC=0.0
      IFLG=1
      PRINT *,'HOW LONG IS THE TIME SERIES?'
      READ(5,*) L2
   89 WELIND 1
      LU=L2
      DO I I=1,L2
      READ(1,*) Z(I)
    1 CONTINUE
   88 PRINT*,' ENTER TITLE '
      READ(5,102) TITLE
      N=3.0
      CC=3.0
  102 FORMAT(A20)
      PRINT *,'DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?'
      READ(5,100) IWHAT
  100 FORMAT(1A1)
      IF(IWHAT.EQ.'Y') THEN
      PRINT *,'WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE:ID1)=0 '
      READ(5,*) ID1
      PRINT *,'WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING:ID2)=0 '
      READ(5,*) ID2
      PRINT*,'TRANSFORMATION COEFF: IP=0 (LN),IP>0(Z(I)=Z(I)*XIP)'
      READ(5,*)IP
      PRINT*,'LENGTH OF SEASON: IS)=0'
      READ(5,*)IS
      LZA=LU
      CALL FTRDIF(ID1,ID2,IP,IS,LZA,Z,SHIFT,LU,IER)
      WRITE (7,'(A50)')' DIFFERENCED DATA'
      WRITE (7,'(1X,F20.10)')(Z(I),I=1,LU)
      ENDIF
      NAC=LU/2
      IF (NAC.GT.45) NAC=45
      NPAC=LU/2
      IF (NPAC.GT.45) NPAC=45
C
      CALL FTAUTO(Z,LU,NAC,NPAC,7,AMEAN,VAR,ACU,AC,PACU,UK)
      WRITE(6,102) TITLE
      WRITE(7,103) TITLE
  103 FORMAT(1H1,1X,A20)
      PRINT*,' MEAN = ',AMEAN,' VARIANCE = ',VAR
      PRINT*,'
```

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```
        PRINT*,
        WRITE(7,101) AMEAN,VAR
101     FORMAT(/,' MEAN =',F12.6,' VARIANCE =',F12.6,/)
        PRINT*,'DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?'
        READ(5,120) IWHAT
        IF (IWHAT.EQ.'Y') THEN
        PRINT*,' LAG  AUTOCOVARIANCE AUTOCORRELATION PARTIAL AUTOCORRELATI
ON PLOT'
        IF (NAC.GT.45) NAC=45
        X1=2.0/(SORT(REAL(LW)))
        DO 2 I=1,NAC
        IF (ABS(AC(I)).GT.ABS(CC)) CC=AC(I)
        IF (ABS(AC(I)).GT.ABS(X1)) THEN
        B='*'
        ELSE
        B=' '
        ENDIF
        PRINT 7,I,ACU(I),AC(I),B,PACU(I)
        WRITE (7,7)I,ACU(I),AC(I),B,PACU(I)
2       CONTINUE
        PRINT*,
500     WRITE (*,500) 'THE APPROXIMATED 2 S.E. BAND IS +/-',X1
        FORMAT (1X,A35,F10.4)
        PRINT*,'*-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND'
        PRINT*,' CLEAR SCREEN, THEN INPUT ANY CHARACTER FOR AUTOCORRELATI
ON PLOT'
2100    READ (*,2100) B
        FORMAT(A1)
        PRINT*,
        PRINT*,
        PRINT*,TITLE
        PRINT*,
        PRINT*,'AUTOCORRELATION PLOT'
        PRINT*,
        IF (X1.GT.ABS(CC)) CC=X1
        N=ABS(CC)*1.1
        X1=ABS(X1)*50/N
        WRITE (*,501) 'LAG',ABS(CC)*(-1.1),'------------------------------------------------------------------------0------------------------------------------------------------------------',ABS(CC)*1.1
501     FORMAT (1X,A3,5X,F6.3,A101,F6.3)
        DO 200 I=1,NAC
        DO 201 J=-50,50
        A(J)=' '
201     CONTINUE
        CC=AC(I)*50.0/N
        CC=CC+.5
        ICC=INT(CC)
        IF (ICC.LT.0.) THEN
        DO 600 J=-50,ICC,-1
        A(J)='*'
600     CONTINUE
        DO 601 J=1,50
```

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```
601         A(J)=''
            CONTINUE
            ELSE
            IF (ICC.EQ.0.) THEN
            DO 602 J=-50,-1
            A(J)=''
602         CONTINUE
            DO 603 J=1,50
            A(J)=''
603         CONTINUE
            ELSE
            IF (ICC.GT.0.) THEN
            DO 604 J=-50,-1
            A(J)=''
604         CONTINUE
            DO 605 J=ICC+1,50
            A(J)=''
605         CONTINUE
            ENDIF
            ENDIF

            ENDIF ENDIF
            A(-X1-.5)=''
            A(X1+.5)=''
            WRITE (8,2000) I,(A(J),J=-50,50)
2000        FORMAT (1X,I3,1X,101A1)
200         CONTINUE
            PRINT x,
7           FORMAT(1X,I2,6X,F12.6,2X,F12.6,1A,1X,F12.6)
            PRINT x, CLEAR SCREEN, THEN INPUT ANY CHARACTER FOR PARTIAL AUTOC
1ORRELATION PLOT B
            READ (8,2100) B
            PRINT x,
            PRINT x,
            PRINT x,TITLE
            PRINT x,
1L AUTOCORRELATION PLOT'                          PARTIA
            PRINT x,
            WRITE (8,1501)'LAG',N,'------------------------------',N
1501        FORMAT (1X,A3,5X,F6.3,A101,F6.3)
            DO 208 I=1,NAC
            DO 209 J=-50,50
            A(J)='x'
209         CONTINUE
            CC=PACU(I)x50.0/N
            CC=CC+.5
            ICC=INT(CC)
            IF (ICC.LT.0.) THEN
            DO 610 J=-50,ICC-1
            A(J)=''
610         CONTINUE
            DO 611 J=1,50
            A(J)=''
611         CONTINUE
```

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```
      ELSE
         IF (ICC.EQ.0.) THEN
            DO 612 J=-50,-1
               A(J)=
612         CONTINUE
            DO 613 J=-1,50
               A(J)=
613         CONTINUE
         ELSE
            IF (ICC.GT.0.) THEN
               DO 614 J=-50,-1
                  A(J)=
614            CONTINUE
               DO 615 J=ICC+1,50
                  A(J)=
615            CONTINUE
            ENDIF
         ENDIF
      ENDIF
      ENDIF
      A(-X)=-.5)=-I'
      A(X)+.5)=-I'
      WRITE (1,2000) I,(A(J),J=-50,50)
208   CONTINUE
      PRINT *,

      IF(IFLG.EQ.1) CALL BARTLT
      ENDIF
C     FOURIER DECOMPOSITION
      PRINT*,' DO YOU WANT THE PERIODOGRAM? '
      READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') CALL PGRAM(Z,LU)
      PRINT*,

C     DO R AND S
C
      DO 4 I=51,2,-1
         AC(I)=AC(I-1)
4     CONTINUE
      AC(1)=1.0
      MXROW=40
      MROW=32
      IF (LU.LT.32) MROW=LU
      NEG=15
      IF (LU.LT.30) NEG=LU/2
      KOL=10
      CONTINUE
      PRINT*,' ENTER THE VALUE OF IRHO (0=HIGH FREQ,-1=LOW)? '
      READ(5,*) IRHO
      IRS=0
      CALL RANDS(MXROW,MROW,NEG,KOL,IRHO,AC,R,S,IWK,IRS)
      PRINT*,' DO YOU WANT ANOTHER 4 AND S ARRAY? '
      READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') GO TO 44
44    PRINT*,' DO YOU WANT THE D STATISTIC? '
```

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```
5480  READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') THEN
        PRINT*, 'ENTER THE MAX AR ORDER ,'
        READ(5,8) IP
        PRINT*, 'ENTER THE MAX MA ORDER ,'
        READ(5,8) IQ
        PRINT*, 'DO YOU WANT TO SEE THE D STAT?'
        PRINT*, '0=YES, 1=NO..), IPNT
        READ(5,8) IPNT
        CALL DSTA(FMXRO,NRO,NEG,R,S,IP,IQ,IPNT)
      ENDIF
      PRINT*, 'DO YOU WANT ANOTHER D STATISTIC?'
      READ(5,103) IWHAT
      IF (IWHAT.EQ.'Y') GOTO 5489
      PRINT*, 'DO YOU WANT FTMXL?'
5490  READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') CALL QLRMXL(Z,LU)
      PRINT*, 'DO YOU WANT ANOTHER FTMXL?'
      READ(5,103) IWHAT
      IF (IWHAT.EQ.'Y') GOTO5490
      PRINT*, 'DO YOU WANT ANOTHER RUN?'
      READ(5,103) IWHAT
      IF (IWHAT.NE.'Y') STOP
      PRINT*, 'WHICH DATA? 0=ORIGINAL, 1=CURRENT..)'
      READ(5,8) IANS
      IF (IANS.EQ.0) GOTO89
      IF (IANS.NE.0) GOTO88
      STOP
      END

      SUBROUTINE BARTLT
      REAL R(-10:60),VR(10),STD(10)
      INTEGER U
      COMMON AC(51)
      COMMON LU
      COMMON NAC
      DO 1 I=-10,0
        R(I)=0.0
1     CONTINUE
      DO 2 I=1,NAC
        R(I)=AC(I)
2     CONTINUE
      DO 3 I=NAC+1,60
        R(I)=0.0
3     CONTINUE
C     REMEMBER R(0)=1
      R(0)=1.0
C
C     BY BARTLETT'S APPROXIMATION, EQU 2.1.11
      DO 5 K=1,10
        X=0.0
        DO 6 U=0,NAC
        X=X+R(U)**2+R(U+K)*R(U-K)-4*R(K)*R(U)*R(U+K)+2*R(U)**2*R(K)**2
```

```
6     CONTINUE
      VAR(K)=X-FLOAT(LU)
      STD(K)=SQRT(VAR(K))
5     CONTINUE
      PRINT*,
      PRINT*,
      PRINT*, ' FIRST LINE VAR(R(K)),SECOND LINE STD(R(K))'
      PRINT*,
      PRINT*,
      PRINT*,
     1          1          2          3      ',  '
     2,   '     4     5     6     9  ',  '  10'
          7     8
      PRINT 23,(VAR(K),K=1,10)
      PRINT 23,(STD(K),K=1,10)
23    FORMAT(1X,10(F12.6))
      RETURN
      END
      SUBROUTINE RANDS(MXROW,MROW,NEG,KOL,IRHO,G,R,S,IUK,IRS)
      DIMENSION R(MXROW,1),S(MXROW,1),G(1),IUK(1)
      CHARACTER IUHAT
      DATA IBLK/1H /,ISTR/1H*/,IZRO/0/
      KOLM1=KOL-1
      DO 5 IC=1,KOL
      DO 5 IR=1,MROW
      R(IR,IC)=0.0
5     S(IR,IC)=0.0
      MN=MROW-NEG
      NEGI=NEG+I
      S(NEGI,1)=1.0
10    R(NEGI,1)=G(I)
      DO 20 I=1,NEG
      NEGI=NEG+2-I
      S(I,1)=1.0
20    R(I,1)=G(NEGI)
      IF (IRHO .EQ. 0) GOTO40
      DO 30 I=1,MROW
      NEGI=I-NEG-1
30    R(I,1)=R(I,1)*(-1)*(NEGI)
40    J1=MROW
      DO 70 IC=2,KOL
      ICM1=IC-1
      J1=J1-1
      IRP1=IR+1
      IF (ABS(R(IR,ICM1)).EQ. 0.0) GOTO50
      S(IR,IC)=S(IRP1,ICM1)*(R(IRP1,ICM1)/R(IR,ICM1)-1.0)
      GOTO60
50    S(IR,IC)=-S(IRP1,ICM1)
60    CONTINUE
      J1=J1-1
      DO 70 IR=1,J1
      IRP1=IR+1
70    R(IR,IC)=-R(IRP1,ICM1)*(S(IRP1,IC)/S(IR,IC)-1.0)
```

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```
       IF (IRS.NE.0) RETURN
   75  FORMAT(A1)
       PRINT*, 'THE R AND S ARRAYS HAVE BEEN CRUNCHED.'
       PRINT*, 'DO YOU ACTUALLY WANT TO SEE THEM?'
       READ(5,75) IWHAT
       IF (IWHAT.NE.'Y') RETURN
       IF (IPHO .EQ. 0) GOTO80
       WRITE(6,200)
       WRITE(7,200)
       GOTO90
   80  WRITE(6,210)
       WRITE(7,210)
   90  WRITE(6,220) (IC,IC=1,KOL)
       WRITE(7,220) (IC,IC=1,KOL)
       DO 110 IR=1,MROW
       IRN=IR-NEG-1
       DO 100 IC=1,KOL
       IUK(IC)=IFLK
  100  IF(IR.EQ.NEG+2-IC) L=K(IC)=ISTR
       WRITE(6,230) IRN,(R(IR,K),IUK(K),K=1,KOL)
       WRITE(7,230) IRN,(R(IR,K),IUK(K),K=1,KOL)
  110  CONTINUE
       PRINT*, 'TYPE ANY CHARACTER TO CONTINUE...'
       READ(5,75) IWHAT
       WRITE(6,240) IZRO,(IC,IC=1,KOLM1)
       WRITE(7,240) IZRO,(IC,IC=1,KOLM1)
       DO 130 IR=1,MROW
       IRN=IR-NEG-1
       DO 120 IC=1,KOL
       IUK(IC)=IBLK
       IF (IR.EQ.NEG+2-IC) IUK(IC)=ISTR
  120  IF (IR.EQ.NEG+3-IC) IUK(IC)=ISTR
       WRITE(6,230) IRN,(S(IR,K),IUK(K),K=1,KOL)
       WRITE(7,230) IRN,(S(IR,K),IUK(K),K=1,KOL)
  130  CONTINUE
       RETURN
  200  FORMAT(//20X,27H( F(M) + ((-1)**M)*ACF(M) ))
  210  FORMAT(//25X,17H( F(M) = ACF(M) ))
  220  FORMAT(//30X,7HR-ARRAY//3H K,11(9X,I2))
  230  FORMAT(2H ,I3,1H),11(1X,F9.4,A1))
  240  FORMAT(//30X,7HS-ARRAY//3H K,11(9X,I2))
       END
       SUBROUTINE DSTAT(MXROW,MROW,NEG,R,S,IP,IQ,IPNT)
C.......................................................
C  DESCRIPTION OF PARAMETERS
C  MXROW - ROW DIMENSION OF R AND S ARRAYS IN CALLING PROGRAM
C          (INPUT)
C  MROW - NUMBER OF ROWS TO WHICH R AND S WERE CALCULATED.(INPUT)
C  NEG  - NUMBER OF ROWS OF NEGATIVE LAG IN R AND S ARRAYS(INPUT)
C  R    - R ARRAY.  DIMENSIONED MXROW BY K IN CALLING PROGRAM,
C         WHERE K IS GREATER THAN OR EQUAL TO KOL.(INPUT)
C  S    - S ARRAY.  DIMENSIONED AS R ARRAY IN CALLING PROGRAM.
```

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```
C   IP  - (INPUT)MAXIMUM ORDER OF AUTOREGRESSION PERMITTED.
C          (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
C   IQ  - (INPUT)MAXIMUM ORDER OF MOVING AVERAGE PERMITTED.
C          (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
C   IPNT- PRINT CONTROL PARAMETER (INPUT)
C          IPNT = 0   D STAT VALUES ARE PRINTED
C          IPNT NE 0 PRINTING IS SUPPRESSED.
C          WITH IPNT = 0 THE WRITE STATEMENTS REQUIRE THE INPUT VALUE
C          OF IQ TO BE LESS THAN TEN.
C
C   NOTE   NEG MUST BE GREATER THAN OR EQUAL TO IP+IQ+3, FOR IP AND
C          IQ THEIR INPUT VALUES.  FURTHERMOREMROJ MUST BE GREATER THAN
C          OR EQUAL TO NEG-IP+IQ+4, FOR IP AND IQ EQUAL TO THEIR INPUT
C          VALUES. IF IP+1)8(IQ+1) IS GREATER THAN S0(WHERE IP AND IQ ARE
C          AT THEIR INPUT VALUES) THEN THE DIMENSION OF STAT MUST BE CHANGED
C          ACCORDINGLY.
C

      DIMENSION R(MXROW,1),S(MXROW,1),STAT(50)
      DATA IPP/6/,IZRO/0/
      JPP=IP+1
      JQQ=IQ+1
      IQF=JPP+JQQ
      DO 40 I=1,JPP
      JP=I-1
      DO 40 J=1,JQQ
      JQ=J-1
      JK=JQQ*(I-1)+J
      ISUB2=NEG-JP+JQ+2
      ISUB1=ISUB2-1
      IP1=IP+1
      IM1=I-1
      BOT=(S(ISUB2,1)+S(ISUB1,IP1))**2
      IF(I.GT.1) GO TO 20
      DO 10 JI=1,3
      NEGM=NEG-JP-JQ-JI+1
      NEGP=NEG-JP+JQ+JI+1
10    BOT=BOT+R(NEGM,I)**2+R(NEGP,I)**2
      GO TO 35
      ISUB3=ISUB2+1
20    BOT=BOT/(S(ISUB3,IM1)+S(ISUB2,I))**2
      DO 30 JI=1,3
      NEGM=NEG-JP-JQ-JI+1
      NEGP=NEG-JP+JQ+JI+1
      NEGM1=NEGM+1
      NEGP1=NEGP+1
30    BOT=BOT+(R(NEGM,I)/R(NEGM1,IM1))**2+(R(NEGP,I)/R(NEGP1,IM1))**2
35    NEG0=NEG-JP-JQ
      NEG1=NEG0+1
```

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```
        ARG=S(NEG0,IP1)/(BOT*S(NEG1,I))
        STAT(JK)=ABS(ARG)
        IMX=I
        XMX=STAT(1)
        DO 50 I=1,IOP
        IF(STAT(I).LT.XMX) GO TO 50
        IMX=I
        XMX=STAT(I)
50      CONTINUE
        IQ=(IMX-1)/JQQ
        IQ=IMX-(IP*JQQ)-1
        IF(IPNT.NE.0) RETURN
        WRITE(IFR,100)
        WRITE(7,100)
        JQQ=JQQ-1
        WRITE(7,110) IZRO,(I,;I=1,JQQ)
        WRITE(IPR,110) IZRO,(I,I=1,JQQ)
        DO 60 J=1,JPP
        JM1=J-1
        IST=JM1*(JQ2+1)+1
        IEND=IST+JQQ
        WRITE(7,130) JM1,(STAT(I),I=IST,IEND)
        WRITE(IPR,120) JM1,(STAT(I),I=IST,IEND)
        WRITE(7,130) IP,IQ
        WRITE(IPR,130) IP,IQ
        RETURN
100     FORMAT(//50X,'D STATISTIC'//29X,'ORDER OF MA')
110     FORMAT(' ORDER OF AR ',10(4X,I3,4X))
120     FORMAT(/4X,I2,6X,10(1X,E10.4))
130     FORMAT(// ORDER OF AUTOREGRESSION SELECTED ',I4/
     ' ORDER OF MOVING AVERAGE SELECTED ',I4)
C
        END

        SUBROUTINE PGRAM(Z,LW)
        DIMENSION Z(368)
        REAL INTNCTY
        SINT=0.0
        PI=3.14159265
        PRINT*, LW= ',LW
        PRINT*, ' HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?'
        PRINT*, ' 0 - DEFAULT OF 45, N.LT. LW/2 ..>'
        READ(5,*) N
        IF (N.EQ.0) N=45
        IF (N.GT.LW-1) N=45
        WRITE(6,78)
        WRITE(7,78)
        DO 20 I=1,N
        A=0.
        B=0.
        DO 10 IT=1,LW
        XARG=2.0*PI*FLOAT(I)*FLOAT(IT)/FLOAT(LW)
        A=A + Z(IT)*COS(XARG)
        B=B + Z(IT)*SIN(XARG)
10      CONTINUE
```

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```
          A=2.*A*FLOAT(LU)
          B=2.*B/FLGAT(LU)
          INTNCTY=(FLOAT(LU)/2.)*(A*A + B*B)
          FQ=1.0*I/LU
          P=1.0*FQ
          WRITE(6,77) I,FQ,P,INTNCTY
          WRITE(7,77) I,FQ,P,INTNCTY
          SINT=SINT+INTNCTY
   20   CONTINUE
   77   FORMAT(1X,I3,2X,F5.3,2X,F7.3,2X,F18.3)
   78   FORMAT(2X,'I',5X,'FQ',6X,'P',15X,'INTNCTY')
        PRINT*,
        WRITE (6,2631) SINT/N
        WRITE (7,2631) SINT/N
 2631   FORMAT(1X,'AVERAGE INTENSITY=',F20.10)
        RETURN
        END

        SUBROUTINE OURMXL(Z,LU)
        DIMENSION Z(366)
        INTEGER IND(8),IER
        REAL ARPS(6),PMAS(6),GR(24),AA(740)
        CHARACTER IWHAT
        IND(1)=LU
        IND(5)=500
        IND(6)=4
        IND(7)=6
        IND(8)=5
        PRINT*, ' INPUT P, ORDER OF AR**'
        READ(5,*) IP
        IND(2)=IP
        PRINT*, ' INPUT Q, ORDER OF MA**'
        READ(5,*) IQ
        IND(3)=IQ
        PRINT*, ' INPUT D, ORDER OF DIF**'
        READ(5,*) ID
        IND(4)=ID
        PRINT*, ' INPUT S, NUMBER OF SIGNIFICANT DIGITS REQUIRED**'
        READ(5,*) IS
        IND(6)=IS
        PRINT*, ' INPUT I, ITERATIONS REQUIRED W/O CHANGE TO DIGITS**'
        READ(5,*) II
        IND(8)=II
        PRINT*, ' DO YOU WANT TO INPUT ESTIMATIONS FOR THE COEFICIENTS?'
        READ(5,103) IWHAT
        IF(IWHAT.EQ.'Y') THEN
          IND(7)=1
          IF(IP.EQ.0) GO TO 152
          PRINT*, ' INPUT AR ESTIMATES INDIVIDUALLY'
          DO 151 I=1,IP
          PRINT*,' ?',
          READ(5,*) ARPS(I)
  151     CONTINUE
  152     IF(IQ.EQ.0) GO TO 154
```

```
      PRINT*,'INPUT MA ESTIMATES INDIVIDUALLY'
      DO 153 I=1,IG
      PRINT*,' '
      READ(5,*) PMAS(I)
153   CONTINUE
154   ENDIF
100   FORMAT(1A1)
      CALL FTMXL(Z,I^D,ARPS,PMAS,PMAC,UNU,GR,AA,IER)
1001  FORMAT(/,' UNU ',IND(5),' ,I3,' IER ',I3,/,
     .  F8.2,' PMAC ',F12.6)
1002  FORMAT(/,' ARPS VALUES')
1003  FORMAT(/,' PMAS VALUES')
      WRITE(6,1001) IND(5),IER,UNU,PMAC
      WRITE(7,1001) IND(5),IER,UNU,PMAC
      WRITE(6,1002)
      WRITE(7,1002)
      DO 20 I=1,IP
      WRITE(6,8) ARPS(I)
      WRITE(7,8) ARPS(I)
20    CONTINUE
      WRITE(6,1003)
      WRITE(7,1003)
      DO 40 I=1,IG
      WRITE(6,8) PMAS(I)
      WRITE(7,8) PMAS(I)
40    CONTINUE
      RETURN
      END
```

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VITA

Albert Craig Dremstedt was born in Evansville, Indiana, on 10 April 1954 and graduated from Mt. Vernon Senior High School in Mt. Vernon, Indiana, in May 1972. Following two quarters of study at the University of Evansville, he enlisted in the Air Force on 10 April 1973 and was subsequently stationed at Hickam AFB, Hawaii, as a General Accounting Specialist. In August 1975, he was accepted into the Airman Education and Commissioning Program (AECP) and was subsequently discharged in September of the same year so that he could continue his undergraduate studies at the University of Evansville. Following graduation in February 1978 with a BS in Computer Science, he was commissioned as a 2nd Lt and assigned to the Air Force Manpower and Personnel Center at Randolph AFB, Texas, where he served as both a personnel and an operations research analyst. In 1981, he was selected to attend the Air Force Institute of Technology at Wright-Patterson AFB, Ohio.

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R and S Array Analysis

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This thesis develops statistical techniques for determining Air Force officer separations and retirements. The analysis techniques used were linear regression and Box and Jenkins' time series. The regression models developed for both separation and retirement predictions were very accurate. The FY81 separation prediction was in error by only 1.8% and the FY82 separation and retirement predictions were in error by 16.9% and 2.1% respectfully. Moreover, a modified update procedure was in error by only 9.6% for the FY82 separation prediction. This compares to errors in loss predictions of 1.7% to 79.9% for

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the currently used models. The independent variables used were separation and retirement application approved and in-system. The R^2 ranged from .75 to .99 for all data bases used in the research. Although time domain time series models were developed which adequately fit both separation and retirement patterns, both failed to accurately predict either short or long term trends.

```
      PROGRAM TS(INPUT,OUTPUT,TAPE6=INPUT,TAPE6=OUTPUT,TAPE1)
      COMMON AC(51)
      COMMON LU
      COMMON NAC
      INTEGER NAC,NPAC
      CHARACTER IUK(80),IWHAT
      CHARACTER TIT:EX20
      REAL R(40,40),S(40,40),Z(368),ACU(50),PACU(50)
      REAL UK(50)
      CHARACTER A(-50:50)
      CHARACTER B*1
      REAL M
      REAL CC
      CC=0.0
      IFLG=1
      PRINT *,'HOW LONG IS THE TIME SERIES?'
      READ(5,*) LZ
89    REWIND 1
      LU=LZ
      DO 1 I=1,LZ
      READ(1,*) Z(I)
1     CONTINUE
88    PRINT*,' ENTER TITLE '
      READ(5,102) TITLE
      N=0.0
      CC=0.0
102   FORMAT(A20)
      PRINT *,'DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?'
100   READ(5,100) IWHAT
      FORMAT(1A1)
      IF(IWHAT.EQ.'Y') THEN
      PRINT *,'WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE'
      READ(5,*) ID1
      PRINT *,'WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING?'
      READ(5,*) ID2
      PRINT*,'TRANSFORMATION COEFF: IP=0 (LN),IP>0(Z(I)=Z(I))'
      READ(5,*)IP
      PRINT*,'LENGTH OF SEASON: IS>0'
      READ(5,*)IS
      LZA=LU
      CALL FTRDIF(ID1,ID2,IP,IS,LZA,Z,SHIFT,LU,IER)
      WRITE (7,'(A50)') DIFFERENCED DATA'
      WRITE (7,'(1X,F20.10)')(Z(I),I=1,LU)
      ENDIF
      NAC=LU/2
      IF (NAC.GT.45) NAC=45
      NPAC=LU/2
      IF (NPAC.GT.45) NPAC=45
C
      CALL FTAUTO(Z,LU,NAC,NPAC,7,AMEAN,VAR,ACU,AC,PACU,UK)
      WRITE(6,162) TITLE
      WRITE(7,103) TITLE
103   FORMAT(1H1,1X,A20)
      PRINT*,' MEAN = ',AMEAN,'VARIANCE = ',VAR
      PRINT*,'      ',AMEAN,'      ',VAR
```

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